

# HUMANITIES NETWORK



Newsletter of the California Council for the Humanities

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## Doctors and Society

What does it mean to be a physician? How does medical training affect the attitudes and the lives of those who go through it? And when granted the degree of Doctor of Medicine by members of the profession, should the physician have the exclusive right to decision-making in matters of healing? Is there in fact a role for lay people — analogous to a jury which consists of non-lawyers — to judge what a physician's credentials should be and whether he or she is living up to them?

The CCH has supported a number of projects dealing with the role of doctors and other healers in society,

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*"I swear by Apollo Physician, by Aesculapius, by Hygieaea, by Panacea . . . that I will carry out . . . this oath . . . I will use treatment to help the sick according to my ability and judgment, but never with a view of injury and wrong-doing. Neither will I administer a poison to anybody when asked to do so . . . I will keep holy both my life and my art . . ."*

From the Hippocratic Oath  
(Fourth century, B.C.)

## Council Announces New Guidelines

The California Humanities Council announces that approximately \$800,000 will be available to support new projects during the 1982-83 grant year. This is a substantially larger sum than had been predicted earlier in the light of federal budget reductions. It includes matching funds raised by the Challenge Match process.

Proposals will be accepted for the July 31, 1982, deadline in the four new grant categories described below, as well as in the previous categories of Public Policy, Local and Cultural History, and Public & Community Programs. Similarly, the October 31 deadline will be open to both old and new categories. Thereafter, beginning in January, 1983, only the following categories will apply.

Before writing up full proposals, applicants are requested to send for guidelines and application forms, then to submit a two-page synopsis of their project to the nearest CCH office (San Francisco or Los Angeles). They should telephone that office within a few days to discuss their concept and possibly make an appointment with a member of the program staff.

Current category descriptions are now as follows:

### 1. The Humanities and Contemporary Issues

Projects in this category will demonstrate the contributions of the humanities to the understanding of issues in contemporary society. Proposals should address questions important to civic life in California which are in need of broader public understanding and deliberation. Applicants should clearly describe the specific contributions which the disciplines of the humanities can make to the examination of the issues and the ways in which particular issue areas may be enlightened through the perspectives of the disciplines.

Funds in this category will be principally reserved for projects solicited by the Council through a Request for Proposal process. The RFP will specify desirable topic areas and the range of activities sought by the Council, so that the project may have a significant impact on the public understanding of broader dimensions of contemporary issues. Such projects will include opportunities for extensive interaction among humanists, experts, policy-makers, and various citizens' groups in the form of research papers, conferences, and broad media dissemination.

### 2. The Humanities in California Life

Grants in this category are designed to enhance the California public's

## Clio Among the Doctors

By Thomas W. Laqueur

The most advanced group of medical students in the joint Berkeley-UCSF program was far from welcoming. One of them called me late in the evening of the day they learned that I was to join them for a year and demanded that I come to a meeting the following day to discuss the matter. I did my case no good by being unable to meet until the day after, when, after an uncomfortably hasty bag lunch, they proceeded, in what I still regard as stridently prosecutorial tones, to question me as to my motives. I explained that I had a grant from the American Council of Learned Societies and from other sources to

study medicine for a year; that as a historian with an interest in the history of medicine I wanted to gain first-hand experience of the process

Dr. Thomas W. Laqueur is an associate professor of history at the University of California, Berkeley. He holds a bachelor's degree from Swarthmore College, a Ph.D. from Princeton University, and also studied at Oxford University. He is the author of "Religion and Respectability," Yale University Press, 1976.

whereby doctors learned to look at their patients and see, abstracted from them, those pathological states known as disease.

They were not much taken by my explanation: why, if I were interested in how clinics worked and how doctors were educated, didn't I go straight to UCSF and observe the mainstream, rather than take courses in the heterodox Berkeley program? I tried to explain that I was not so much interested in the sociology of professionalization but rather in its epistemology, and that for my purpose taking pathology with them would do as well as taking it with the orthodox on Mount Parnassus. They remained hostile. I would, they felt, violate the sanctity of the doctor-patient interaction. Admittedly, they themselves were not yet fully qualified to be present at or even participate in the privileged moment. But they, at least, were violating the holy for good purpose: they would be doctors and would eventually help other patients, if not the very ones they observed. I, on the other hand, was simply a voyeur.

My defense (in retrospect both priggish and phony) was that I hoped, by becoming a better teacher of the history of medicine, to affect the way would-be physicians thought about their profession and thus the way they would treat their patients. Moreover, I suggested that it was unclear in a great number of cases whether medical intervention was of unambiguous benefit to the individual or society—that is, whether they would be "doing more good" by their work than I by mine. But my heart was not in these arguments, which, in addition to being unpleasant, in no way related to the real and justified anxieties of these medical students.



The Extraction of the Stone of Madness by Pieter Breugel, 1557

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## GRANTS AWARDED

# Local and Cultural History

## THE HOLLYWOOD LOCAL PHOTO EXHIBIT

**Sponsor:** Film Arts Foundation, San Francisco

An exhibit of 30 to 50 photos telling the story of Hollywood's unions during the 1930s and 1940s will be prepared for statewide distribution to museums, union halls, libraries and community centers, to accompany presentations by labor historians and actual participants in the union struggles.

It will relate the experiences not only of writers and directors and actors, but of the workers behind the camera — carpenters, painters, electricians, editors, costumers, and many more. The efforts and achievements of their guilds and unions are tumultuous in themselves and significant to the understanding of the political events that took place in Hollywood in the 1950s.

## LOS PEÑASQUITOS CULTURAL AND NATURAL RESOURCE CENTER

**Sponsor:** The San Diego Ecology Centre, Inc.

This grant will support planning for the development of educational programs, literature, exhibits and audiovisual materials to illustrate the history, archaeology and ecological elements in San Diego's Los Peñasquitos Canyon Preserve.

A cultural and natural resource center to be established at the Taylor-Johnson Adobe Ranch House will recreate the lifestyles of earlier inhabitants, with special materials directed toward school children, local residents, and tourists. Volunteer and professional groups interested in anthropology, archaeology, history and the environment will take part.

# Public Policy

## SCHOOL SITE COUNCIL/UCI HUMANITIES PROJECT

**Sponsor:** School of Humanities, University of California, Irvine

Scholars from the School of Humanities will work with School Site Councils (parent-teacher teams charged with change and improvement of individual school instructional programs) from 62 schools. The goal is to increase Council members' understanding of the relevance of the humanities to their deliberations and their awareness of how humanistic conceptual frameworks can apply to questions of curriculum, school organization and deliberative processes.

A Humanities Team of scholars will plan and put on a Site Council Humanities Conference to identify Councils that wish to participate in 1982-83, and will then consult with these Councils on an individual basis.



From a project on the history of neighborhoods in Oakland

## WORKSHOP ON LABOR SONGS AND LABOR LORE

**Sponsors:** Center for Labor Research and Education and Institute of Industrial Relations, University of California, Berkeley; Central Labor Councils of Alameda and San Francisco Counties.

A three-day workshop will highlight the history, traditions and cultural diversity of labor in California and on the west coast. It will focus on aspects such as the importance of lumber, longshoring and maritime trades, the farmworkers, and the Mexican-American traditions in California's work force.

The format will include lectures and discussions on the language, art and culture of the working people, as well as performances of songs and folklore, panel discussions of folk songs and folk culture, and two concerts.

## STRANGE AND WONDERFUL HARVEST - THE DEVELOPMENT OF PORTUGUESE-JAPANESE INTER-ETHNIC AGRARIAN COMMUNITY IN SACRAMENTO'S POCKET DISTRICT, c. 1920 - c. 1942

**Sponsor:** Portuguese Historical and Cultural Society, Sacramento

Sponsors will develop a slide-tape program to be used in conjunction with a symposium documenting the emergence of an agrarian community of Portuguese and Japanese in the greater Sacramento area, beginning at the end of World War I. The project

will explore how these two apparently disparate peoples came to occupy the same lands and develop interdependent communities, against the background of the larger society which regarded them both as alien but was openly discriminatory toward the Japanese.

Historians and anthropologists from all three ethnic groups will act as consultants and participants, and the program will be made available throughout the state.

## EXPLORING COMMUNITY HERITAGE THROUGH A COMMUNITY HISTORY FAIR

**Sponsor:** Santa Barbara History Fair, UC Santa Barbara

The Santa Barbara History Fair is a community education program sponsored by the County Superintendent of Schools, the Chamber of Commerce, and the University of California at Santa Barbara in conjunction with local heritage groups. It will develop and disseminate materials and information about the concept and operation of a community history fair, as an example of a humanities project which can help to revitalize history as a discipline in secondary schools as well as create community support for history education and inform community members about the value of history and sharing their local heritage.

The project's goal is to encourage history fairs in other California communities and eventually to promote a statewide fair. Products will include a directory of interested persons and

groups, a handbook, a newsletter, and a series of seminars and conferences resulting in the formation of a statewide California History Committee.

# Public and Community Programs

## TWO CENTURIES OF HISPANIC THEATRE IN THE SOUTHWEST

**Sponsor:** Revista Chicano-Quena, University of Houston, Texas

A multi-media exhibit on the development of Spanish-language theatre in the southwest from the late 18th century to the present, has been assembled and will be shown for three to four weeks at a time in a number of locations in California, Arizona and Texas.

California sites are the Student Union Gallery at UCLA in July, the Oakland Museum in August, and the Centro Cultural de la Raza in San Diego in September.

The exhibit consists of a more than 100-piece photo essay, a collection of artifacts including costumed mannequins of three important stage characters, a 20-page illustrated booklet and a videotape of a famous actor in some of his well-known roles. Two days of conferences and live performances will open the exhibit at each site.

Funding for this project is shared by the Humanities Councils of Arizona and Texas.



# Six Members Join Humanities Council

The Humanities Council welcomes six new members, two of whom were appointed to the organization by California Governor Jerry Brown.

**Carlos Cortes**, Professor of History at the University of California at Riverside, holds degrees in communications and public policy, journalism, foreign trade, and Portuguese and Spanish, as well as his Ph.D. in History from the University of New Mexico.

He received UC Riverside's Distinguished Teaching Award in 1976; he is the author of many teacher training and curriculum materials, articles and books, and editor of two major book series, *The Mexican American* and *The Chicano Heritage*. Cortes is a consultant to various government agencies at all levels including school systems, and to private organizations and universities.

**Lloyd B. Dennis** is senior vice president and director of public affairs of the First Interstate Bank of California, with headquarters in Los Angeles. He is a member of the bank's Good Government Fund committee, chair of its Charitable Contributions and Social Policy committees, and president of the First Interstate Bank Foundation.

He was formerly national chair of the Coro Foundation and is currently an advisor to its board of directors. He holds a Master of Arts Degree from the School of International Service, American University, and a Bachelor of Arts Degree from the School of Communications at Boston University. Dennis has published many articles on banking and public affairs, corporate communications and public policy issues. He conducts a graduate course, "Public Affairs and Business," at the University of Southern California School of Public Administration.

**Carmen A. Estrada** is Director of Employment Litigation for the Mexican American Legal Defense and Educational Fund (MALDEF) in San Francisco. She received the degree of Juris Doctor from the Hastings College of Law. She is a member of the San Francisco Lawyers' Committee for Urban Affairs, the California Statewide Professional Standards Review Council, and the Federation of Women Lawyers' Judicial Screening Panel.

Estrada is also an instructor in Law and Social Change at San Francisco State University and teaches Law and the Layperson at the Peralta Community College District. She received the Los Padrinos Humanitarian Award and recognition as Outstanding Young Woman of America in 1980; the Mexican American Political Association, San Francisco Chapter, Public Service Award in 1981.

**Sylvia Lodge Marks**, a gubernatorial appointee to the Council, is a writer and lecturer based in Santa Monica. Author of the best-selling *Smoking is for Suckers*, she founded and serves as president of Smokestoppers, Inc. She has been active and held executive positions in many volunteer organizations, including the City of Hope, the World Affairs Council, Women For, Head Start, Neighbors of Watts.

Marks attended the University of Pennsylvania and the University of California at Los Angeles and holds a

certificate for Adult Counseling. She counsels senior citizens under a research grant from Volunteer Services for Older Persons at Cedars Sinai.

**Franklin C. McPeak**, Senior Corporate Vice President and member of the Board of Directors of McClatchy Newspapers in Sacramento, has been with that company since 1946. He holds a A.B., M.A., and Doctor Juris degrees from the University of the Pacific and serves as a part time instructor in the School of Business at California State University, Sacramento.

Among the directorships that McPeak holds, in addition to McClatchy Newspapers, are the American River Hospital, the United Way,

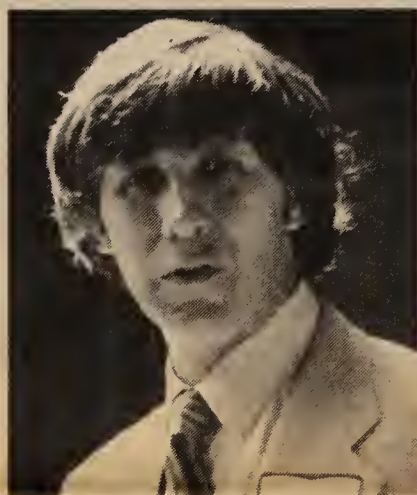
Safety Council, and Stanford Home. He is also a member of the Business Advisory Board of public television station KVIE in Sacramento; past president of the Eleanor McClatchy Performing Arts Center, member of the President's Advisory Board of Sacramento City College, chair of the United Negro College Fund for the Sacramento Area, and a Colonel in the California National Guard, in addition to chairing the Sacramento Area Board for National Guard and Military Reserve.

McPeak was appointed to the Humanities Council by Governor Brown.

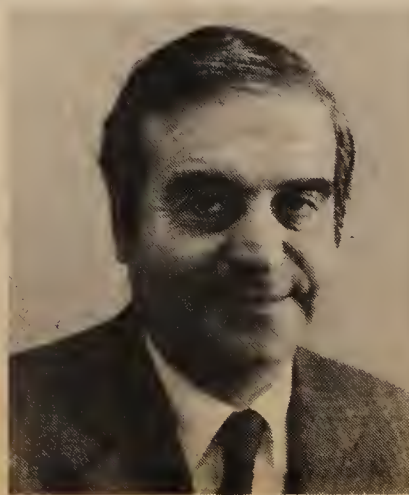
**Andrea L. Van de Kamp** is manager of public affairs for the Carter Hawley Hale Stores, Inc., in Los Angeles. She

holds a B.A. degree from Michigan State University and an M.A. from Teacher's College at Columbia University. She was formerly director of development at the Museum of Contemporary Art and is presently National Chairman of the Board of the Coro Foundation.

Van de Kamp has served as Executive Director of the International Academy of Estate and Trust Law, as Associate Dean of Admission at Occidental College, as Assistant Director of Admissions at Dartmouth College and as Director of Recruitment in the Department of Nursing at Columbia University. She has won awards as an Outstanding Young Business Leader of Los Angeles and Outstanding Young Woman of America.



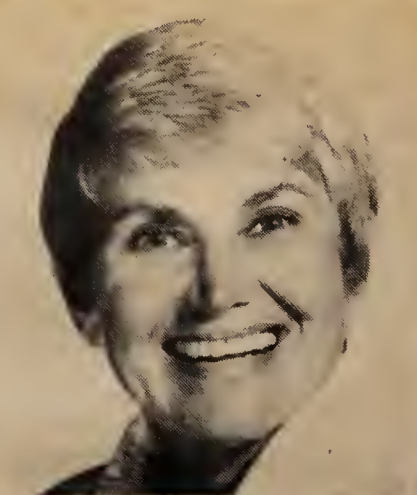
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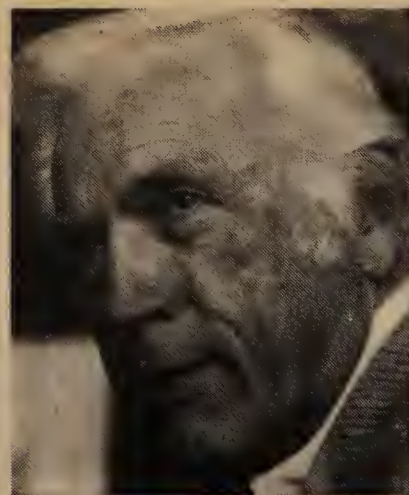
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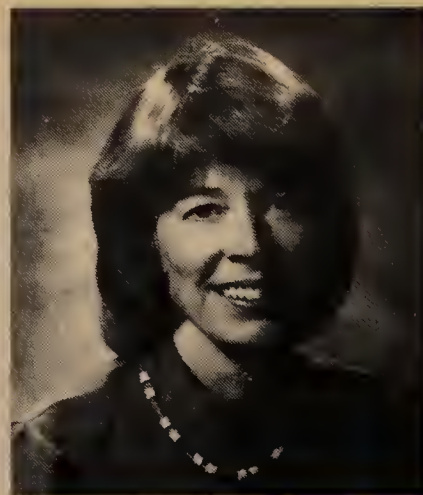
CARMEN A. ESTRADA



SYLVIA LODGE MARKS



FRANKLIN C. McPEAK



ANDREA L. VAN DE CAMP

## Council Films and Radio Projects Win Awards

Recent awards to CCH-funded projects honored five film projects and two radio programs.

*The Day After Trinity*, the celebrated film on the events leading up to the first atomic explosion, has won another of television's top prizes: the prestigious Peabody award for distinguished programming in broadcasting. Sponsor of the film is public television station KTEH in San Jose.

*A Cowgirl's Song: Crisis on the Range*, a film that chronicles the struggles of cattle ranchers in northeastern California, was awarded a Gold AGGY from AGRI Educator magazine in its sixth annual film award presentation, and a Gold Eagle certificate from the Washington, D.C.-based Council on International Nontheatrical Events

(CINE) which sponsors American films in international festivals. Its sponsor is the Modoc County Chamber of Commerce.

*Salmon on the Run*, sponsored by the Bay Area Video Coalition and featured as part of the TV series NOVA, took a second place at the American Film Festival in New York as a Video Documentary Segment in Environmental Issues.

*TV, the Enchanted Mirror*, sponsored by the Film Arts Foundation of San Francisco, was featured at a recent film festival in Palo Alto, and selected for the 8th Annual Global Village Video and Television Festival in New York.

*California Rights*, a documentary

on the effect of the California constitution on individual civil rights and civil liberties, under the sponsorship of the San Diego State University Foundation for KPBS-TV, won an EMMY in the documentary program category from the San Diego chapter of the National Academy of Television Arts & Sciences.

*Computers*, a segment of California Public Radio's program *Matrix*, was a runner-up in the Arts and Humanities Coverage category of the 1982 Public Radio Program Awards. An individual program, *One Toe Over the Line*, on the subject of non-violent civil disobedience, received honorable mention in the News and Public Affairs Documentary category.



# Clio Among the Doctors

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We went back and forth for at least an hour. I was getting the good parts of medicine without suffering the bad, they said, meaning that I wouldn't be taking biochemistry. ("The good parts," I said to myself, "Do they know what an associate professor makes?") "What if we were at the bedside of a patient and our preceptor mentioned 'S1 and S2' [the sounds made when the mitral and aortic valves close] and you, not knowing what he meant, would have to ask, thus retarding the class's progress?" I assured them that I did know these codes and that, if I didn't, I knew when to shut up. By the end I hated them and didn't want to take their classes. I realized that I was, in part, suffering the fate of every new kid on the block, of an outsider confronting a small intimate group who had been through the wars of anatomy, physiology, and pharmacology together. I did not then understand that they were essentially right about a physician's relationship to a patient. Through all the technology, cynicism, and abstruse language, it still partakes of the Aesculapian mythos: of a god coming down from the heavens, touching a mortal, and removing what makes him unwell. They were novitiates for a priesthood, and I was an ignorant and unsanctified intruder. I had not, for example, suffered the trials of the pre-med and ignominies of medical school admission, nor would I pass through the fires of national boards, internship, and residency. I was, in short, unprepared for knowledge.

Neither my ACLS application nor my conversation with the medical students had captured the full animus of my interest in the clinic. I also wanted this year in medical school for more personal and not easily articulated reasons. My father is a pathologist. As a child, I spent many, many Sunday mornings in his laboratory watching him prepare surgical specimens or checking equipment or reading. I also remember him sitting with friends (especially old friends he had known from Istanbul, where in the 'thirties and 'forties he had been a resident and then a professor), telling stories of uterine carcinomas or necrotic livers. Not immediately appealing to a child, one might think—but it

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was like listening to the old men of the tribe telling stories of battles long past of great hunts successfully completed. It was the mode through which tribal loyalties are forged. At the time, I thought it quite magical that my father and his friends could remember features of slides they hadn't seen for twenty years, or indeed that they could make any sense at all of the pink and blue sponge and gossamer-like patterns I was allowed to look at when my father took breaks from his almost nightly microscopy. I was also allowed to use my grandfather's old monocular, gold-plated microscope. He too had been a physician, a radiologist in the earliest days of that profession, and I viewed this relic of his student days with the child-like awe reserved for the old, the mysterious, and the profoundly important. My grandfather had won an Iron Cross of some grade or other for serving as physician to a World War I typhus hospital—or so said my grandmother, who lived with us and who told me stories of hearing Brahms conduct, and of dining once at the German Imperial Court.

With this emotional baggage I entered upon my year of medical school. I also had perfectly sound and defensible reasons for being there. I had studied some sciences in college; history of science had been one of my examination fields in graduate school; and I had taught undergraduate seminars at Berkeley in the history of medicine. Most historians of medicine are trained first as physicians; it is clearly desirable for a historian to learn something substantive of the discipline he proposes to study. But I also hoped that they year would confirm what, in moments of self doubt, I questioned: that one could be a serious adult and not be a doctor. Failing that, there was always the possibility of quitting my profession and becoming a "real" student.

I and the twelve matriculated students of Berkeley's first-year class began medical school with an intensive ten-week anatomy course—six to eight hours a day four or five days a week. Though one is told of people fainting at the first dissection, none of us was the slightest bit squeamish. I think we were too frightened about destroying structures which we were supposed to identify or failing to see what the dissection manual told us was there. We soon learned to distinguish the vast amounts of fat and connective tissue of which the body is composed from the "important" features we were to observe.

I now understand perfectly why anatomists well into the seventeenth century saw in the human body a number of openings, nerves, and even organs which Galen identified but which are not there. The power of an anatomy book, and more importantly of its illustrations, is enormous. I remember asking one of my colleagues, perhaps the most academically gifted of the group, a question about the course of the recurrent laryngeal nerve and its entry into the muscles of the voice box. We were peering intently at the body which we had been told was "our text," and she replied quite unselfconsciously, "I don't know—let's look it up in the book."

For weeks, indeed for most of the summer, our cadaver seemed like Ladakhi hinterlands—wildly exotic

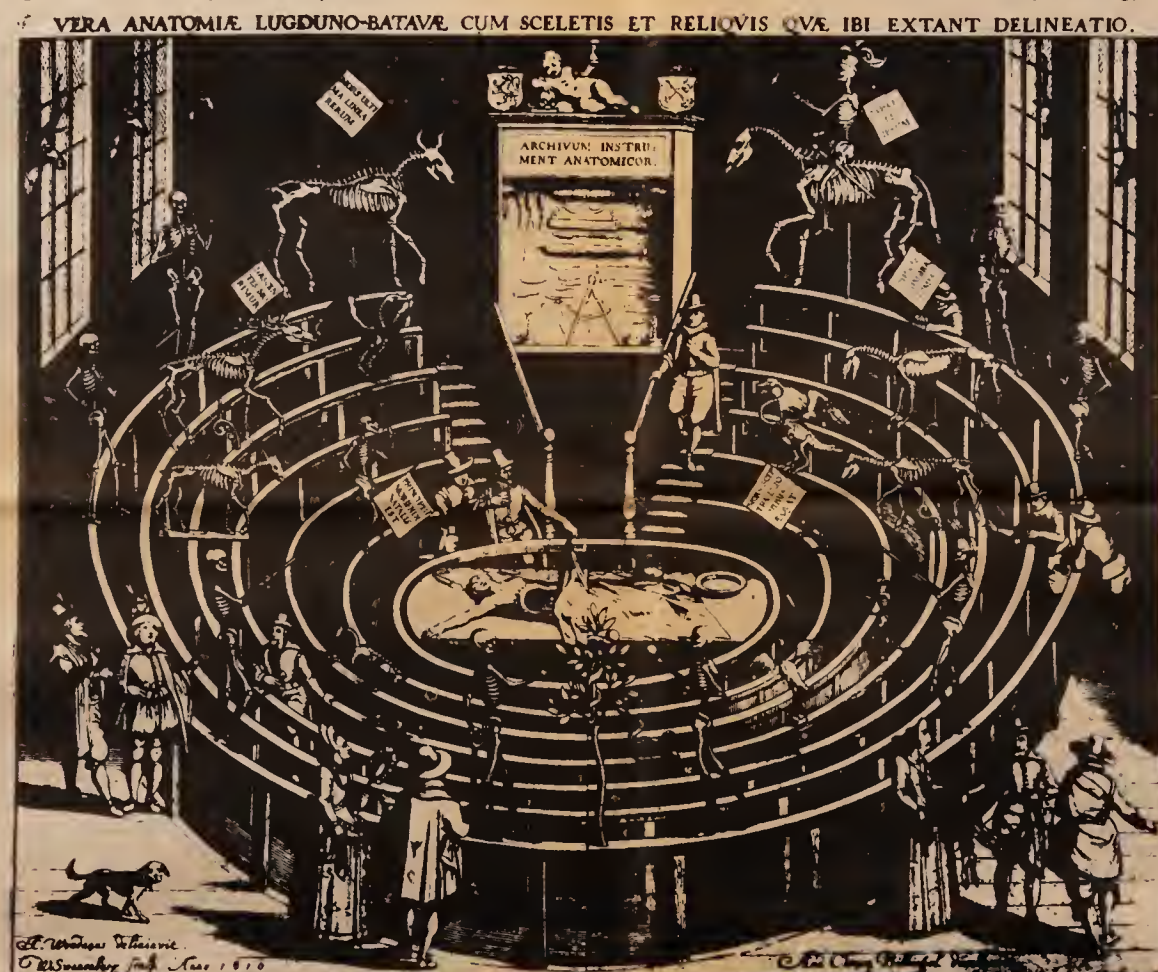
and, though familiar from pictures and travel guides, still profoundly strange. I suspect that the real purpose of anatomy in medical teaching is to break down that strangeness, to learn that the body is not bounded by the opaque and inviolable wall of flesh and skin which for most of us defines its limits. Once we had crossed this most intimate of borders, each exercise made us feel less like foreigners on the other side. Galen was right, though, in viewing dissection as an introduction to mysteries no less deep than those of Eleusis or Samothrace.

One never again sees a head in quite the old way after neatly sectioning it lengthwise (an Ace Hardware hacksaw is the preferred tool). Bodies, to me, are simply different now that I have meticulously disassembled one. Mysteries reappear, however, when technology makes possible a new plane of vision. Ordinary X-ray films, for example, are but an extension of old ways of seeing the body anatomically. Since Galen and perhaps before, one dissected from the outside in, from front to back. But now, with computerized axial tomography (CAT), one can see the body in cross-section, for which one is not prepared by the occasional anatomical cross-section. We were like Galileo's colleagues seeing for the first time the moons of Jupiter when, in a class on interpreting X-ray films, we saw slice after slice of the body, not from the familiar front to back, but as if magically looking down from the top of at least fifty levels. Our shared distrust of high-technology medicine did not diminish the wonderment and attraction of this new and unexpected way of seeing.

After the hostility of the third-year students, the friendliness and camaraderie of the entering class (not to speak of their help in circumventing the teacher's request that I not actually dissect) was a great relief and pleasure. In the mornings, when the instructor was about, I worked mostly by checking problems in the dissection manual, participating in reviews—the exercises in which we took turns pointing at structures and saying "I'll call this \_\_\_\_\_," hoping that one's tablemates would concur in the labeling. In the afternoons and evenings, when the instructor was away, I could work more freely. One table left for me an entire arm to dissect; only the right one had been required for class. Another left the orbit of the eye: the socket. (Therein lies the trochlea, a pulley which allows the muscle to contract in one direction and move the eye in another, the sort of device an eighteenth-century theologian would have adduced as evidence for the existence of a very clever creator.)

Pathology, Introduction to Clinical Medicine, and Introduction to Physical Diagnosis, all of which I took with the second-year class, were the core of my academic curriculum during most of the year. In the spring and the summer I spent two or three days each week at UCSF, first in the gastroenterology and then in the vascular surgery clinic. Though I did not have the therapeutic responsibilities which third- and fourth-year medical students were beginning to assume, I was allowed to watch procedures, attend conferences, and occasionally question and examine patients under a preceptor's supervision. I also made

rounds Sunday mornings with an internist who is the husband of one of my history students. These mornings were my only opportunity to see ordinary medicine as opposed to the hothouse practice of a great teaching hospital and the neatness of carefully manipulated introductory clinical case. They were also great fun for me in the way that a visit to a foreign country is fun after a year of studying its language. At breakfast after rounds I could actually practice talking Medicine, not fluently or without recourse to gesture and quizzical looks at the native speaker, but well enough to be understood. The ability to use a new language was also one of my satisfactions in doing clinical medicine homework. No "real" medical student could have been happier to get the occasional "excellent" or "very good" on write-ups in which, imitating the native, I would use phrases like "cardiogenic shock," "pulmonary vascular



A 1610 engraving of an anatomy lesson from the Rijksuniversiteit, Leiden

congestion," and "transudation of fluid," and be understood.

The sentence "the body was opened with the usual Y-shaped incision" invariably began the autopsy reports which used to litter the daybed in my father's study. In my youth I regarded that phrase with that comfortable familiarity and utter incomprehension with which Cornish peasants in the middle ages must have regarded the pronouncements of the Latin mass. And it was one of my triumphs in medical school finally to see the referent of this epithet from my youth. There in the Oakland morgue I saw bodies opened with the "usual Y-shaped incision"—the foot of the Y extending from abdomen to breastbone, the two branches diagonally across.

Learning to talk like a doctor is in more than a trivial sense what medical school is about. It is not simply a question of vocabulary words, of being

able to translate "sweating" as "diaphoresis" or "shortness of breath" as "dyspnea," although this is clearly part of the exercise. More important is learning the structures of thought, the canons and formulae of the discipline as they are enshrined in its textbooks. Nearly every student in the country learns pathology from Robbins' Pathology and internal medicine from Harrison's Principles of Internal Medicine, now in its eleventh edition. And, if they don't use these, they use others almost identical to them. In chapter after chapter of Robbins, the great nineteenth-century German model of the discipline is propounded. Notwithstanding chapters on genetic disorders, immunology, environmental and nutritional diseases, and so on, the basic model is what it was for Virchow in 1850. In the beginning there was the cell; the organ is, however, the essential loci of disease—and the task of pathology is

were being coached in the forms of medical discourse. This was strikingly unlike history, where one is rewarded for clever departures from traditional forms.

My relationship to clinical talk and perception was complex. Generally, I loved hearing Medicine spoken and relished my rudimentary facility in the language. I enjoyed discussing the week's cases with my father during our long-distance calls; I enjoyed the clinical conferences as much for their stylized dramatic qualities as for their content. And I was pleased and touched when, near the end of my studies, I met the father of one of my university colleagues, a distinguished neurologist, and could spend the afternoon listening somewhat knowingly to his stories of diagnosing brain lesions before the days of the CAT scanner. He seemed to regard me as a colleague.

On the other hand, the gap between my own and a physician's immediate perception of a case could be dramatic. A woman who had had most of her stomach removed appeared one day at the gastroenterology clinic complaining of severe abdominal pains which came on after eating, and which had begun about a year before, right after her last operation. She also reported gaining over sixty pounds since then. Here was a woman with no stomach to speak of, who experienced great pain after eating, but who had nevertheless gained sixty pounds. Curious. I was given the opportunity to elicit her history, and I inquired whether anything else had happened around the time of her operation. Yes, it had, she replied; her only daughter had been murdered and she had moved up the Delta to be with her sons. My preceptor and I both murmured something about being sorry. She talked on about her pain, which, she said, was extremely intense—unlike any pain she had experienced, except for the pains of labor. Before examining her, the physician explained to her the relationship between caloric intake, exercise, and weight gain: if we use fewer calories than we take in, we develop a positive balance and gain weight, much like a bank account which grows when deposits exceed withdrawals. She listened politely. However, while preparing herself for the physical, she returned again to the similarity between her current pains and labor pains.

As we walked out my mind was abuzz with the triad "weight gain—loss of daughter—gut pains like labor," a constellation I couldn't relate precisely but one which appeared effortlessly if inchoately in my consciousness. My preceptor, on the other hand, was irritable; he hated patients like this. In his mind, the differential diagnosis was clear: ischemic bowel disease, no evidence; adhesions, not likely; thus, gas. He gave her something for it, but clearly he had seen one too many psychogenic gas problems to be very sympathetic. Not of much interest, nothing much he could do.

My gastroenterologist teacher could be faulted for not allowing the patient enough time to tell her own story; we were told in class always to leave a few minutes of undirected time to let the patient say what he or she wanted. Had he left this woman more time,

the story of the murder might have emerged on its own. But it would have mattered little. Medicine is not equipped to deal with the complex relationship among the violent death of this woman's daughter, her incessant eating, and abdominal pains. Not even psychiatry is up to the task. The power of medicine as a discipline is to diagnose organic disorders and initiate the appropriate therapy. My preceptor's mind was working just as it had been trained to work. The course of the treatment which he offered undoubtedly alleviated some of her pain. My culturally and socially more intricate analysis would have done her little good.

Much of the nature of medical discourse would be familiar to a historian or a literary critic, although the texts of the doctors are not as comfortably distant as ours. In pathology, our class was guided in reading bodies much the way an eighteenth-century clergyman might guide a visitor to his parish in "reading" the pews in his church or the graves in his churchyard. Each told of the life of the community. And so in death. In the Oakland morgue we watched the autopsy of an elderly woman who had died in a fire. But did she perhaps die of a heart attack before the fire? No evidence of coronary artery disease, we noted as the pathologist lifted out the heart, turned it so we could see, and sliced into it. Lots of residue in her windpipe, we noted as he slit it open. She probably died of smoke inhalation. Everyone noted assent. Her hyoid bone—the one just above the Adam's apple—was removed, and its delicate cornu were seen to be intact. So she had not been strangled. She was probably an alcoholic. Her uterus and external genitalia, skillfully removed in one piece—the private parts rendered very public—suggested that she hadn't had any children. And so on, as the body was read to us and interpreted.

Medicine is, like history, an interpretive discipline; disease might indeed be metaphor. But my most immediate impressions, again and again, were of the sheer physicality of disease and the body. The body might be a text, but there it was before one, manifest in all its infirmity. On the first day of Introduction to Clinical Medicine, we examined a muscular, seemingly healthy thirty-five-year-old man whose heart muscle had simply ceased working properly: idiopathic cardiomyopathy (that is, failure of the heart for reasons unknown). We dutifully put our stethoscopes to his chest and pretended to hear something meaningful in the various swishes, lubdubs, and clicks which came through the earpieces. Whatever his heart might be a metaphor of, it was nevertheless not working, and no amount of cultural exegesis would render it whole.

My Sunday rounds provided constant reminders of the ultimate and indisputable triumph of the flesh, of nature over culture: a ninety-four-year-old woman with decubitus ulcers, deep bedsores, admitted from a nursing home; a man dying of infection or of the spread of cancer after having his rectum and bowel removed; an old man with prostatic carcinoma. All of this was, of course, routine in the trade and would not have seemed strange to the ordinary person of the historical period I study, simply be-

cause disease and death were public then: only the poor died in hospital. But my own life before last year had given me no concrete sense of what ashes to ashes, dust to dust meant.

Much of my time in medical school I felt as if I belonged, but I could not help on occasion feeling the sophisticated otherness of the anthropologist amongst the tribe of doctors. Modern medicine, especially medicine within the complicated hierarchies of a teaching hospital, is highly ritualized and self-consciously theatrical. In the case of clinical conferences this is obvious: they are public performances matching the great against the less great, the elders of the tribe against callow youths. A resident of fellow presents a case bit by bit, stopping at the appropriate moment to allow an expert consultant the opportunity to comment. If the resident tries to be too clever, confuses clues, or doesn't give away enough information, the consultant's initial discussion has no substance, and the audience loses interest. But if he gives away too much, the diagnosis will be too obvious too early; he will lose the opportunity to stump the expert, and the drama will lose its tension. As with a good mystery writer, the trick seems to be to give away just the right number of clues, elicit comments, ask what more one would need to know, offer that information, let the expert try again, offer a little more, have the expert commit himself, then spill everything and see if the audience agrees with the expert. The audience comments according to rank and degree of importance, and all the tribe seems to know just how the hierarchy is structured. The drama works as well among equals—without the resident-versus-consultant tension; then it becomes a contest in the telling and interpretation of tales, in who is cleverest in making sense of a body of data.

The court of Louis XIV could have had no more elaborate ritual of precedence or public order than that of a teaching hospital. The greats talk only to other greats; the eminent consultant who rules out a particular procedure to halt fatal bleeding of esophageal varices prefers to give his views straight to the professor of vascular surgery, not to one of his underlings. Nurses pump out the stomach, fellows perform the various manipulations to try to stop the bleeding, medical students note the patient's progress and report to the surgical and medical residents, who in turn report to their superiors. And dying, like court ritual, is carefully orchestrated. It must be done privately. When a particular patient seemed near the brink—that is, when he was coughing up great quantities of fresh blood—the green curtain was quickly drawn round his bed in the intensive care unit, and we all huddled closely within its bounds, cut off from the blinking light and the semi-conscious person in the next bed. When the bleeding abated for the moment and out patient was not dead, the curtain was pulled back, and we reentered the world of the blinking lights. Then, perhaps an hour later, the curtain would sweep round again.

Strict academic precedence is also observed in watching a procedure. The teaching scope would make its

Continued on Page 6



## NEH Budget is Before Congress

The process by which the budget for the National Endowment for the Humanities will be set for Fiscal Year 1983 is under way now in Congress. While overall federal budget ceilings have been approved by both houses, the final figure for NEH is in the hands of the Sub-Committee on Interior of the Appropriations Committee, which will begin to meet in mid-July.

The figure currently in use is \$96,000,000 which would represent

a major cut in NEH funding; due to the complexity of the budget-setting process, it is possible that the size of the reduction may be substantially less.

Persons with an interest in the future of federal support for the humanities should communicate their opinions to their congressman at once, since it is known that there are strong positions in Congress on both sides of the issue.

## Doctors and Society

Continued from Page 1

their relationship to patients, the question both practical and philosophical of where ultimate responsibility and authority lie in the field of health care—with the licensed practitioner—with the sick patient—or in cases involving terminal illness or abortion, with the religious community or the legislature.

This issue of *Humanities Network* features an essay entitled "Clio Among the Doctors" by Professor Thomas W. Laqueur of the History Department of the University of California at Berkeley, who teaches the history of medicine and history of science. Dr. Laqueur underwent a year of medical training for personal as well as professional reasons: his father and grandfather were both physicians and he questioned, he says, whether one could be a serious adult and not be a doctor.

The essay appeared first in the "Perspective" section of *The Three-penny Review*, a quarterly review of criticism, the arts, and society, distributed largely in Northern California. The review sponsors a project funded

by a CCH grant which commissions articles by prominent humanities scholars under the general rubric of "Humanities and the Real World." As a historian, Dr. Laqueur does indeed bring a unique perspective to the experience of medical school.

The other comments printed here on the relationships between doctor, patient, and the public, come from a project sponsored by the Board of Medical Quality Assurance of the State of California, entitled, "Reviewing the Legal Definition of Medicine in California: Medicine, Ethics, and Public Policy." The statements are taken from interviews for *California Times* radio series programs based on the project. Unfortunately, space permits only the briefest sampling of the provocative discussions that took place.

Other projects that have dealt with the same general subjects from a number of different points of view include "Bioethics and Human Values," sponsored by the San Jose/Santa Clara chapter of the National Conference of Christians and Jews; "Physi-

## New Guidelines

Continued from Page 1

understanding of the humanities, including both traditional and modern interpretations. Projects may range from examinations of subject matter within the several fields of the humanities to historical treatments of the diverse strands of the California experience to explorations of contemporary themes in cultural life. Special emphasis will be given to: (a) employing new means to increase awareness of the traditions; (b) reaching new constituencies; (c) extending and bringing awareness to new themes and modes in the humanities. The Humanists-in-the-Schools program

(funded through RFP's) is part of this framework.

### 3. Development of Humanities Resources

Projects in this category will seek to draw upon the resources of the humanities to promote the use of and encourage public attention to the humanities in California. Grants will aid information-sharing, clearing-house, brokering, and coordinating activities on behalf of the humanities. Projects may demonstrate more effective use of existing resources, enhance the work of institutions in promoting public awareness of the humanities, generate new information, or assist in generating private support for the humanities.

### 4. Dissemination of the Humanities

Projects in this category are designed to disseminate humanities programs and information to large public audiences. Projects may either expand distribution of already existing materials, or they may produce new video, radio, or print materials for wide public distribution.

The allocation of funds in this category will include current CCH commitments to the joint fund with the California Public Broadcasting Commission and open-competition re-grants for projects which through radio, print media, or other means provide broad dissemination of the humanities and existing humanities projects in California.

### Planning and Mini-grants

In addition to these major categories, the Council will also continue to offer planning Grants (up to \$500) and Mini-Grants (up to \$1,000) for small-scale activities which fall in any of the above categories.

cians and their Culture," sponsored by the Lincean Club of Los Angeles; "Interface Between Humanities and the Physician," sponsored by the Center Group of Palm Springs; "Emerging Perspectives on Health," sponsored by Pacific Medical Center, San Francisco; "Health Care and Human Values," sponsored jointly by the Department of Philosophy and the Division of Nursing at California State University, Chico. Still others are "Ethics, Literature and Medicine," sponsored by the Institute of Social Ethics at the University of Southern California; and "Decision-Making in the Health Care Relationship: A Challenge for Choice and Change in Public Policy," sponsored by the Health Care Consortium, San Francisco.

The Council has supported projects in which other professional groups explored, with the help of scholars in the humanities, the relationships between their profession and the larger community—projects for lawyers, architects, scientists, and business leaders. Proposals from such groups are encouraged. d.r.

## Clio Among the Doctors

Continued from Page 5

way like the single eye of the Fates around the group, ranged in absolute order of importance, that had gathered to witness a delicate maneuver. (I placed myself just after two medical students and before an undergraduate doing the compulsory volunteer service required for admission to medical school.) The scene of the chiefs of the tribe gathered around a tiny body illuminated from within by a powerful light and surrounded by perhaps fifteen lesser personages, arranged in ranks and preparing for full membership in the tribe, seemed like a transposition to Mount Parnassus of an exotic bit of African ethnography.

After a year amongst the doctors and would-be doctors I was content not to join them. Early in the year, the persistent semi-conscious whispers that I should have been one of them and that only medicine gave meaning to life ceased. But mine was a bitter-sweet contentment.

There is a level of intimacy between doctor and patient built not just on the efficacy of modern treatment, but

on the very old magic of touch. "Bed-side manner" is the trivialization of a potentially profound capacity to make human contact. We don't have that touch in my profession. There is, moreover, a seriousness in medicine and medical teaching which even the cynicism of all-night calls and hospital bureaucracy do not efface. There is no question, at least in the moment, that what is taught and what is learned matter. In clinical teaching, this seriousness is reinforced by the presence of the body, of the patient, in which textbook theory is rendered into breathing reality. The clinical teacher is very much the master craftsman demonstrating to the less skilled what a knowing touch, question, or other intervention can accomplish. This mode creates an immediate bond between teacher and student, more personal and, for an instant, closer than any possible in the abstract and rarified realms of the historian.

But the immediacy of touch and human contact do not make them unambiguously significant. Insofar as I felt that my work as a historian had no

meaning, I very soon discovered that I could have felt the very same doubts were I a physician. True, in that role I could, with a few strokes on a prescription pad and instructions to a patient, meddle with the very molecules whose doings constitute the processes of life.

But as history and the experience of any physician suggest, human health and well-being are very largely the result of social and not clinical factors. CAT scans and chemotherapy may aid in the diagnosis and temporary alleviation of a farmworker's lymphoma, and learned debates on the nomenclature appropriate for these tumors may result in a system of classification with greater prognostic accuracy, but social medicine—the discovery that pesticides cause these cancers—is of no relevance in the clinical moment. What in some sense really matters is beyond the physician's grasp. In any case, I learned about myself that I was the sort who would question and agonize about meaningfulness or meaninglessness at the first opportunity, even if I were

in the front lines of medical practice.

I do not yet know how a year of medical studies will affect my work. An abiding interest in medicine was strengthened; I started subscribing to the *New England Journal*, which I read with the complacency of one who will not be tested on its contents either as a physician or as a historian. I have settled into writing a book about death, which will include a chapter on how and why eighteenth-century doctors came to study it and make it part of their domain. I will teach a course this year on the meanings of the body—a course which cannot help but be different, and I hope more profound, because I know the physical body far more deeply than I knew it before Anatomy, Pathology, and the clinic. But the year was of greatest significance for reasons quite outside the scope of my grant. The spell of medicine as the key to adulthood—to the wisdom of the fathers, and of my father—was broken at the same time as its great power as a discipline and the scope it offered for imagination were revealed.



## Personal Perspectives on Doctors and Society

### DR. ROBERT M. VEATCH

Professor of Medical Ethics  
The Kennedy Institute of Ethics  
Georgetown University, Washington D.C.

Both patients and health care professionals have been misled into thinking that medical decisions are basically technical and scientific decisions. They don't realize that essentially important value judgments are made in all medical decisions... traditionally physicians have made judgments on the basis of the Hippocratic oath which says that the physician should do what he thinks will benefit the patient according to the physician's judgment.

We'd think that a very good thing until we realize that the patient may not agree with the judgment of the physician, and the Hippocratic physician has traditionally felt that he should do what he thinks best for the patient, even if the patient doesn't agree. The best historical scholarship has indicated that's what the oath meant.

Now anyone who believes in the right of free choice, believes in liberty, would have to question any principle that says a physician has the right to do something to a patient even if the patient doesn't want it. That's the core of the problem of the Hippocratic tradition — that the Hippocratic oath is paternalistic.

There's a very important split, I think, between the philosophical commitments of the medical profession and those of our Anglo-American political tradition. The medical profession has been oriented to producing good consequences; physicians have always talked the language of benefits. Our Anglo-American philosophical tradition doesn't talk benefits and harms; it talks rights. People have the right to life and liberty even if someone else happens to think it's not in their interest to have these rights. I can't shoot you because I think it's in your interest. You have certain rights against me, even though I make a judgment that you would be benefitted by my intervention...

I'm suggesting that there be a covenant between society and the profession that incorporates the belief in values of the broader society... In some cases I'm referring to state policy, but in other cases there will be non-governmental understandings where individual patients will come together with individual physicians and decide what set of values we're going to use.... To preserve freedom of choice for both the practitioner and the patient, we will need this meeting of minds so that patients and physicians will pair up in ways where their values will correspond....

A patient with cancer goes to a physician; the patient may oppose treatment where the physician favors it and the physician tries to entice the patient into the latest chemotherapy-research protocol. Increasingly, in very recent times we're getting just the reverse — a new and very dangerous phenomenon. Some physicians have begun to realize that there's a point beyond which they can't reasonably treat, and they've adopted more realistic values about aggressive treatment and taken a position that they some-

times will not treat patients. But once in a while they will get paired up with a patient who wants to go all the way with this cancer treatment, and that's just as offensive as the older model where the aggressive physician got paired up with the patient who wanted only palliative care. Value matching is going to be critical....

Professionals working out of the Hippocratic tradition will frequently say that some information can be dangerous (to a patient) — can upset people — make them anxious — and therefore they ought not to be told. That's pure Hippocratic ethics, proposed in good faith without any malicious intent. But if one holds that that's not the correct ethical basis — that really the judgment in question ought to be made based on the right of the patient to have the information necessary to make it, then it really doesn't matter whether the professional group believes the information would be dangerous.

In that case the society, if it opts for the right of self-determination, as our courts consistently have done, would take the view that the professional has an obligation to give the information to the patient....

The same holds true for medical experiments. We could take the view that a physician should use his own judgment. Tell the patient that he's in an experiment if the physician thinks it's in the patient's interest — if the physician thinks it's not in the patient's interest, don't let him know. We don't do that. We say as a society that you simply have to get consent from the patient before you put that patient in an experiment. Society has to retain the right to make its own moral choices about the relationship between professionals and lay people...

### DR. MICHAEL CORELLA

Professor of Philosophy  
San Diego State University

The thing that bothers me about the present system of regulation is that it presumes that the average patient, the average person — citizen — is too ignorant, too uncaring, too stupid to know what is in his own self-interest, and that all you have to do is parade in front of him a lot of wild-eyed healers, and he will go for the bait. It may well be true. But my point is that no one becomes mature by being treated like an infant and if we're going to ask the patient to be responsible, we must give him the power to make choices — even wrong choices. That's the way we grow up.

I've found from raising two children that you never gain anything by forcing them to do what they don't want to do — if you want them to be responsible for their behavior you have to give them the power to make choices. What we're doing with the present system of medical licensure and restriction of patient choice is to prolong infantilism on the part of the ordinary citizen.

That bothers me because I think, personally, that a very fundamental dimension of human health is autonomy — the ability to make one's own choices as a mature and responsible human being. But the present system of medicine presumes that in order to make people physically healthy you must take away the one thing that defines them as a healthy human

being — that is, their power of self-determination.

### DAVID SOBEL, M.D.

Acting Chief of Preventive Medicine  
Kaiser-Permanente Medical Ctr., San Jose

I couldn't agree more that both individuals and society as a whole have placed too much power in the hands of the medical profession and at the same time too much responsibility on them as the guardians of health. It turns out that the major determinants of health — namely, our own life style, the environment we live in, our habits — are things which are by and large outside the reach and control of the medical profession. So we can hardly blame them or hold them responsible for those major areas which influence and affect our health. It's there that lay people and citizens need to be taking a much more active and responsible role...

... I can't speak for all physicians, but I think the reactions of physicians to the area of self-care will be quite varied, as you might expect. There are some physicians admittedly who feel it necessary to almost completely dominate and control the interaction with a patient — to dole out, as it were, medications as well as privileges as well as information. For physicians who derive most of their satisfaction from being able to exercise that kind of power, I would suspect that self-care will be quite uncomfortable. I also suspect that there is a large number of physicians who are quite interested in cooperative relationships and partnerships with patients. They would just as soon not use their time to deal with illnesses that people could easily take care of on their own if they have access to information, and would be more than happy to try to facilitate and support that. The physicians can then concentrate on those aspects of medicine for which they were trained and from which they derive intellectual and personal satisfaction, namely, the management of more complex and difficult problems.

I know a lot of physicians are quite excited about an increasing role for patients participating in their care. It provides opportunities for the physician to concentrate more on those areas in which they are more clinically competent and trained to advise people in. So the reaction, as I say, would be mixed among the profession.

### JOHN HENDRY, M.D.

Obstetrician-Gynecologist  
Carmichael, California

... I would really like to believe that the vast majority of patients would be able to form a covenant with their physician or with any other professional whose advice they seek. But I know I can't do that when I go to have my car fixed — I just don't know enough about auto mechanics. I have to sort of accept the fact that this professional person is going to do right by me. Perhaps I should know more about auto mechanics, but I don't, and there aren't a lot of people who know a lot about medicine; so it's very difficult to form a covenant with inadequate information.

The people at this colloquium are continually saying that more information ought to be available to patients,

as if doctors were hiding their chart records from them, or deliberately talking in obscure terms that they could not understand. This will happen on occasion; it was probably more true in the old days than now, but I think doctors invite patients to know about their bodies and about the care that they are going to receive.

But in so many cases the patients do not want to know, or they do not want to know in the way that the physician is presenting it. He's presenting it from the anatomical, physiological perspective, and they are asking their questions from the more metaphysical sense. An example — from gynecology — a patient, when told that she has a vaginal infection, let's say, a trichomonal infection, which is caused by a one-celled flagellate. It's like an amoeba; it's a protozoan, and it grows in the vagina and causes irritation and discharge. So — when a patient asks you, what is a trichomonal infection and you tell her, well you have a protozoan growing, causing irritation and discharge, that isn't really the answer that she sought. It took me a while — several years of practice — before I began to realize this. Really, the patient was seeking another kind of information. Actually, when asking that question, the patient is probably asking where she got the infection. Who gave it to her, and how did he — her husband or significant other — get it, and what does this mean in her life as a result of the fact that this has been passed on to her?

So you have physicians trying to form a covenant on a physiological basis — in other words: this is the pathology and this is the medication and this is the outcome we can expect. And you have the vast majority of patients trying to form a covenant on a more metaphysical basis. And so it just doesn't work...

### ROBERT ROWLAND

Executive Director, California State Board of Medical Quality Assurance

... the overriding phenomenon that I've found so interesting in these meetings is that everyone here, from the physicians to the bureaucrats, to the lobbyists for professional organizations, to even those people that we call public members — they turn out to have a distinctive experience in health care issues — were all sitting around talking about what is best for the public, the people. The whole exercise in one way is patronizing as hell, because we're all talking about someone else's well-being; that is, the people of the state in the largest sense.

It's extraordinarily difficult to avoid this sort of phenomenon, but you do have a roomful of experts who are really arguing about what someone else wants, and that someone else is nowhere around. It's important, I think, for people to try to educate themselves about what it is that they want, to think some about how they want their health care delivery system to be structured and to get that input in to their legislators and to the state regulators, in to their local organizations, if they can, because it is, in fact, their will that we are all trying to reflect.

And I think many of us are very far off the mark indeed.



Doctors and Society

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# HUMANITIES NETWORK

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**Apollo was the patron of healers and purveyor of healing arts**

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# Science and the Leap of Faith

What do scientists, academic humanists and science writers talk about when they meet? At a conference on "Science, Science Writing and the Humanities: Communicating Science to the Public," held at USC earlier this year, they spoke with great passion about technology. Human priorities. The need for a new shared mythology that serves—not destroys—the human race. And they talked about the ways all of this gets translated into public issues. The conference, sponsored by USC in cooperation with the Los Angeles and San Diego chapters of the National Association of Science Writers, was funded by the California Council for the Humanities. USC and the Council for Advancement and Support of Education (CASE) designated the conference an official "Mindpower" event, part of the national campaign to support higher education in America. It attracted science writers, scientists, philosophers and historians from across the country. In the pages that follow you'll find some of what they had to say.

C.P. Snow's notion of two cultures has become a cliché; the idea that there is a gulf of misunderstanding between scientists and non-scientists is so familiar to us that we underestimate its significance. To be sure, Snow's thesis is oversimplified and needs qualification; nevertheless, the over-specialization that Snow deplored 25 years ago is probably even more prevalent today.

Certainly, scholars in the humanities continue to warn us of the blind spots and the perilous successes of science and technology. But the issues they raise seldom show up in the popular press, and are not frequently dealt with even in the magazines, newspaper columns, and radio and TV programs that specialize in science.

This is significant because mankind faces challenges that make cooperation a necessity. Social and economic problems at home and abroad go beyond the reach of single disciplines. If the intellectual framework of scientists has any practical significance for the preservation of civilization, as Snow passionately maintained, a fundamental new paradigm must emerge: a more comprehensive view than is to be found in scientific inquiry.

But much of the language of the scientist makes ideas and information inaccessible to even an educated public.

Because of this, an important role emerges for a "third culture"—science journalism. Science writers are a brave bunch, the mavericks and sometimes the heroes of journalism, engaged in the task of translating difficult abstractions into a language and framework that can be comprehended by the general public.

*Martha Harris is director of the USC News Service. Henry Clark is professor of social ethics and associate director of the Center for the Humanities at USC. They served as co-directors of the "Science, Science Writing and the Humanities: Communicating Science to the Public" conference held here last fall.*

## Science & Humanities: Finding the Common Ground

By Martha Harris and Henry Clark

Science writers themselves seldom have a science background. They are more likely to be highly skilled and intelligent journalists drafted into the specialty by circumstance. In order to function in the world of science, they must be socialized in the scientific community. It is probably not overstating the case to say that as a result, most share with scientists the bias that the world is "a set of problems awaiting technological solutions."

This is not to say they are complacent about the challenges they face nor that they are satisfied with the way science is interpreted to the public. Indeed, David Shaw, media critic for the *Los Angeles Times*, published a lengthy critique of science writing a few years ago in which he indicates that scientists and science writers are united in their desire to find a better way to interpret complex issues to the public. Shaw suggested several reasons that the potential for misrepresentation-cum-misunderstanding is greater and more dangerous with science stories than with almost any other subject matter.

But Shaw's critique said nothing about the attitudes of writers or scientists about the relevance of historical, cultural, or philosophical information or context; nor did it suggest that public understanding of science might be advanced by these perspectives. This omission is significant because academic humanists are a rich and largely untapped resource for making sense out of the human and public issues in science and technology.

By bringing together science writers, scientists, and

humanists in a public forum, we hoped to demonstrate the value of talking about an issue from these different perspectives.

The program was designed so that humanists and scientists would take the lead on the first day and talk about the *issues* inherent in communicating science to the public. The discussions on the second day emphasized the *process* of communicating about science; here journalists took center stage.

The first day's keynote speaker, a biologist, set the tone when he described science as an act of faith based on three assumptions: that there is an order in the universe; that human creatures can discern that order; that it is good to understand the order. He asserted that these assumptions can lead to moral and societal chaos without the counter-balance of myth and mysticism but, since our old myths have failed us, what we desperately need are new myths that force us to consider the wonder and relevance of the human endeavor as a whole: a consensus that would give us a basis for judging what technologies are worth developing and pursuing and which should be guarded against.

A nationally known biochemist whose research focuses on turning simple elements into protein and whose experiments with the "winged bean" and primordial soup hold potential for reducing world famine, spoke next. He described his research, which the audience translated into such issues as famine vs. overpopulation, third-world scientific priorities and the scientific imperialism of the West, money for military vs. money for food research.

Thus the need for a mythology that serves us, and the closeness of the relationship between science and human priorities, emerged as the major themes for the rest of the conference.

(Continued on next page)



## Science and the Leap of Faith

(Continued from preceding page)

One of the moderators wrote, after the conference: "There is abroad in the country now . . . a kind of countercultural humanism which threatens to turn back the clock and direct us away from science and technology toward mysticism, interpersonal relationships or something of that sort."

If that happens it would not be the first time, historian of science Lynn White told the conference. He briefly recounted four great scientific movements, each of which flourished for centuries, produced great things, then decayed. However, he pointed out that even when science decayed, art and the humanities flourished.

Because many of the speakers seemed to assume that today's public is apathetic and often suspicious of science and technology, the speaker from the American Association for the Advancement of Science surprised the audience with statistics that indicated the public's belief in science as a source of benefits for all mankind (for instance, 80% of the population believes that the greatest benefits in modern life come from science and technology).

Concluded the moderator:

*I am struck by the fact that most of the speakers seemed to be concerned about a negative public view of science. To the extent that may be so indicates that many of us here, including not only science writers but the humanities professors, really do have, to some extent, a cheerleader mentality about interpreting science to the public. I suppose that most of you would say, "not guilty." And I would say "Not guilty!" because the parts I'm enthusiastic about are those which are clearly for human benefit rather than human ill. But, still, I think it's an important question for us to ponder: To what extent does the possibility of doing well by doing good as we interpret science to the public cause us to be biased in its*

*favor more than we should be so that we overlook some of the problems?*

For the journalists in the audience and at the podium, the relationship between technology and human priorities and the way that is translated into public issues was perhaps the most compelling theme. The journalists seemed most interested in the decisions that involve all kinds of judgments of fact and probability and questions of value, such as the possible tradeoffs between prosperity to people, jobs, energy in the present, versus our duty to posterity.

One environmental writer said, "I can give you many, many examples of the media covering the small pieces of a story and missing the big picture. What it comes down to is that science writers need to relate technology to the political process; they need to keep technology on the tracks and put it in the proper perspective."

A science newspaper editor observed: "We have developed institutions to control technological advances. They don't work all the time. And being a democratic society, we find it increasingly difficult to develop them. But we keep trying. For instance, years ago a group of science writers met to consider the implications of DNA research. Some wonderful reporting grew out of that. Journalists do try to get at the why and the how as well as the what."

Reflecting on the conference, with its major and minor themes and "non-terminating disagreements," a philosopher offered perhaps the best summary:

*It is important for people not merely to know that if they are men they are likely to have a sexual bias and if they are whites they are likely to have a racial bias. It is important for people to try to find out what their metaphysical biases are. Because if they do not do that, the information that they believe they are giving to the public is going to be very far from pure information. Nobody can discount his biases completely, but he*

*certainly can do it a little bit better if he knows what they are than if he doesn't even know that they exist.*

From the outset, our fear had been that there would be little "meeting of the minds" among the three cultures, that people would talk past each other. Instead, the mix of scientists, science writers, and humanists proved exhilarating. There was a climate of mutual respect that seemed to call forth the best efforts from all speakers, and a sincere effort to avoid the buzz words and shorthand that short-circuit communication.

What can we identify as outcomes? Some have been journalistic: both a science TV program and a major magazine of popular science are planning pieces on world hunger based on issues raised in this conference; a scholarly journal is considering publishing excerpts from some of the panels; "California Times," the humanities radio program sponsored by the California Council for the Humanities, featured the conference in a half-hour program.

But there are other, more-difficult-to-assess outcomes. It is difficult to tell whether these science writers are more attuned to their own philosophic predispositions and biases, whether they are convinced that humanists and humanistic issues have a place in the telling of science, whether these writers are our best hope for bridging the "three culture" gap.

Despite the journalists' enthusiasm for the dialogue, we suspect it will take many more such encounters and more initiative on the part of humanists before we see much change in the way science is communicated to the general public. What we have established with this project is that in such a mix, journalists, scientists, and humanists can communicate across spheres of interests; that human priorities are survival issues which put us on common ground; that in this process new metaphors and images about science can be developed that will be useful in translating science to the public.

## On the need for new myths and the search for new meanings

By Paul Saltman

I look upon science, and upon the humanities, and upon communications, not as institutional endeavors, but as human endeavors, as people. I first began to brood about the issue of science and values as a radical on this campus.

A faculty colleague, J. Wesley Robb, would unleash me once a year to debate a local theologian they would bring in for Religious Emphasis Week. I would come out of my my atheist headquarters near my test tube and go a few rounds with him.

But one night, a young woman came up to me after I had demolished some Episcopalian who hadn't done his homework. She said to me, "You must be joking about what you said up there, because if you take my God away from me, I don't know what I would do."

That really got to me. Indeed, I think that night, Reverend Robb won ten points in heaven from his God on the basis of converting an atheist to agnosticism. I never engaged in those debates again.

Because that's when I realized that I could not and should not try to take anything away from anybody without trying to replace it with something equally sustaining. And I realized that science was not that.

One of the great crises of our time is that we are a civilization without myths and faiths. I worry about things like the debates between chemist Linus Pauling and atom scientist Edward Teller. The issue there was, in effect, whose science is good science. At least on the face of it. But Pauling and Teller were actually arguing identical science with differing human values.

Teller argued that an increase of a thousandth of one percent in the radiation damage of a God-knows-what megaton bomb is trivial. Pauling argued back that .001% translates to 20,000 babies born mutated or still. And that's 20,000 too many.

Was their science the same? Identical. Only their values differed. Was either man more qualified to give us values than the other?

Another example: I was hired to be provost of the University of California, San Diego, because I was 6-foot-5, weighed 220 pounds and bore pain well. It disturbed me a great deal to see mobs of people screaming, "Power to the people!" because the power they demanded was to destroy the computer center, to burn the library and to stop the military industrial complex from raping the university. There was a need for some kind of belonging, for righteousness. But as a result, a rational understanding of the role of a university in a free society had vanished. A myth was created, and in the name of that myth — power to the people — we almost suffered a terrible

anarchistic faith.

Another example: Two years ago, at UCSD, a scandal broke. One of the faculty members had been carrying out recombinant genetic research forbidden under the then guidelines of the Biohazards Committee, working with a virus that had been considered, at that time, a dangerous pathogen. The episode was reported brilliantly in some of the local newspapers and even on the pages of *Science and Nature*.

What came out of that event, for me, was not the curse of modern science tampering with the future of life on earth. What came out was the strength and courage of a young

graduate student who said *No* to the research, who stood up and said, "My ethics decry that you should put us all in jeopardy both biologically and socially and morally by breaking the law."

What played out in that confrontation has little to do with the pathology of viruses in monkey tissue cells. It has more to do with the pathology of the human spirit that we read about to this day in *Chemical and Engineering News* or in *Science and Nature*: scientists faking and breaking in the name of ego.

One last example: Linus Pauling again. How can a man with two Nobel prizes come out for

### The functions of science in society

In today's society, science has essentially three functions.

One of these is simply to satisfy our curiosity — to tell us how the world works. But, although science gives us, constantly, "hows," it does not, within itself, have the power to answer the ultimate "why." Why are we here? Science, then, is not truly, and never can be, metaphysics. I think even when you imagine the end of the universe, there's still something in our minds that says: What then, after that?

The second function science plays in our society is, through its predictive power, to provide us wisdom. It can help us to get some idea of the probable outcome of our actions. Today, with our science, there are two attitudes that will help us to use it wisely. One is to keep asking how good the predictions are, how good is the science. The other is to consider how willing we are to alter our behavior in the face of predictions.

Science's third function — and here is where I think the big leap of faith lies — is in providing power. Power has always lain with those who knew something that someone else didn't know. The astronomers of the Middle Ages were terribly popular with kings because they could predict when the planets would be in conjunction. Power has always been knowing that which somebody didn't know and science today tends to seem dangerous because of this power that it gives us.

□

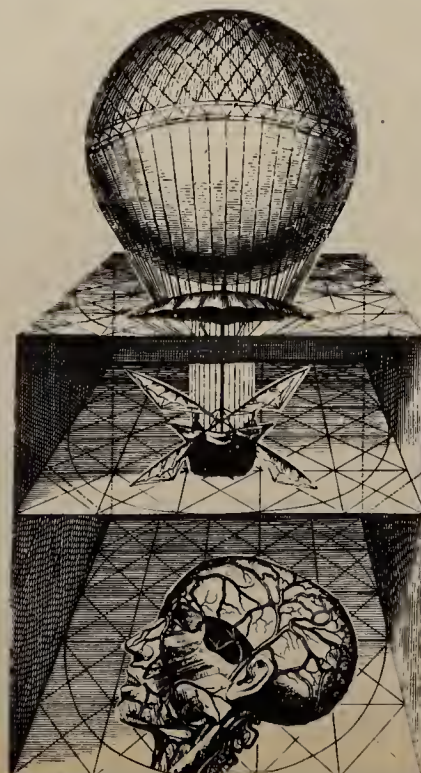
It's not too difficult to get across to ordinary people some of the basic ideas that can come out of science. And it's the wisdom that we get from this kind of a perception that is terribly important.

The power that we are using now comes out of a concept of efficiency. The need to put numbers — numerical efficiency — at the top of our value system. And this is one of the things that comes out of science. We tend to count up everything. Scientists are great at numbers and this is why computers are so much fun because they give us a lot more numbers to fool around with.

But you cannot quantify sunsets, you cannot quantify how a good wine tastes. There are a lot of things that have tremendous value in human life that don't come out of the concept of efficiency, which derives from science. It's more important to place it in a proper perspective and I think the most fatal error that we might be in the process of committing would be to give that concept a prime place on our altar of knowledge as a substitute for philosophy and meaning.

—Mary Eleanor Clark

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Mary Eleanor Clark is a professor of biology at San Diego State University. The author of a widely used introductory biology text and of numerous articles, she was named "Professor of the Year" in 1981 by the Council for Advancement and Support of Education.



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megavitamin therapy in the absence of universally verifiable scientific experimentation? It reflects something taking place in our society, where people seize upon megavitamins and bean sprouts and tofu in a search for immortality. And that gets me to the crux of the issue — the need for myth in an age of science.

I get disturbed most of all about the way people get confused about what constitutes science and technology, and what constitutes ethics and values. As much as people say, "I understand it, baby, don't hawk me about that stuff," I think that some persons, especially some who write for the popular press, don't express it very frequently. And I think they should brood about it.

Science is a search for the nature of the universe in which we live, for the rules that govern the universe from the subatomic particle to the outer reaches of space and time.

It tests the relationships that can be observed or verified experimentally, and allows us to understand ourselves in this immense and wondrous place.

Science is *what is*. And technology is the application of science, of knowing, to our lives. You can talk about science in terms of  $E = MC^2$  — which is what is — and about technology in terms of atomic bombs or nuclear reactors — the application of knowing.

To know the structure of DNA and its function, that's science. To use that knowledge to splice a gene, to create a pathogen, to cure a genetic anomaly, to put nitrogen fixation into a rice plant, that's technology.

The business of applying knowledge brings us into serious problems. Because that application has an enormous component of value judgment. Not economic decisions or cost-plus analysis — that's the cop out. The serious issue is *what do we do with the knowing?*

Caltech, where I served some time as a student, once prided itself on humanizing scientists. We bent over a curriculum that consisted of two-thirds scientific courses and one-third humanities. That was to make us cultured.

That was lucky for me — without my good grades in humanities, they would have taken away my scholarship and wouldn't have let me play ball. But generally, Caltech was a polarized world, where the humanities folks felt that they were the slaves of the scientists. That terrible polarization bothered me.

As a naive Pasadena jock, I actually believed that there was no inconsistency between the humanities and the sciences. I still believe they are complementary. And yet they have started fighting one another.

The fighting has gotten worse because the humanists have chickened out of the game. They have adopted psychoanalytical approaches; they have embraced semiotics; they've grasped Marxism as the answer, but haven't told us the question.

They have lost sight of the real beauty of the humanities: expounding the joy of being different, embracing the wonders of it all, breaking free of the rational demands of science and not being locked in by the demand for universal validation. The humanities allow us to articulate our own personal, experiential, existential positions. They give us insight into ethics and values and morals. A piece of music, a poem, a play — even, God forbid, a movie. Would you believe *television*?

Why have humanists lost that? I don't know, but it's a sadness that we have polarized ourselves.

Let me curse my brothers and sisters in science who embrace science as a means of escaping from moral or ethical commitments. They put on their white coats, go into the laboratory and do their own thing, muttering that they don't want to be bothered by those other issues, that they are above it all. That kind of dogmatism in science is totally unacceptable.

I believe that science is a humanistic endeavor. I practice it that way because science, in leading us to knowledge of the universe and its creatures, extends man's vision and enriches us. There is in scientific endeavor a spirit of creative insight every bit as strong as that in art and literature. Above all, beyond the creativity and the existential feeling that comes with discovery, science is the joy of sharing with others the knowledge that represents the true humanistic spirit.

In doing science, I also find myself committing a series of religious acts of faith. I believe that scientists are very religious people.

The first article of faith is that there is order in the universe. I cannot prove that to you, but I can believe it and seek it.

The second article of faith is that I — a human creature — can discern that order. I'm smart enough to do that.

The third act of faith I commit when I chop up a rat or grind up a plant is that it is good to understand that order. A value judgment.

In propounding those acts of faith, I find myself in a curious argument with a lot of the anti-technology, anti-science folks in the world, because I think the biggest problem we face is that we need myth and mysticism in an age of reason. And nobody's giving them to us.

I think that modern man knows he's alone in the immensity of the universe. Nowhere is man's faith, his destiny, preordained. It's up to him, personally, to choose between the kingdoms of light and of shadows. But damn few people want to make that decision for themselves. Every one of us wants to be absolved of personal responsibility. People read more astrology than astronomy.

Personal responsibility is a terrible burden. It causes people to throw up, as Jean Paul Sartre told us. We want absolution, that appeal to higher powers: gods, goddesses, faiths, mystic spirits, controlling our lives and destinies, to whom we can sacrifice and pray. In short, I would like the tooth fairy to come and touch me and give me a free trip to Stockholm.

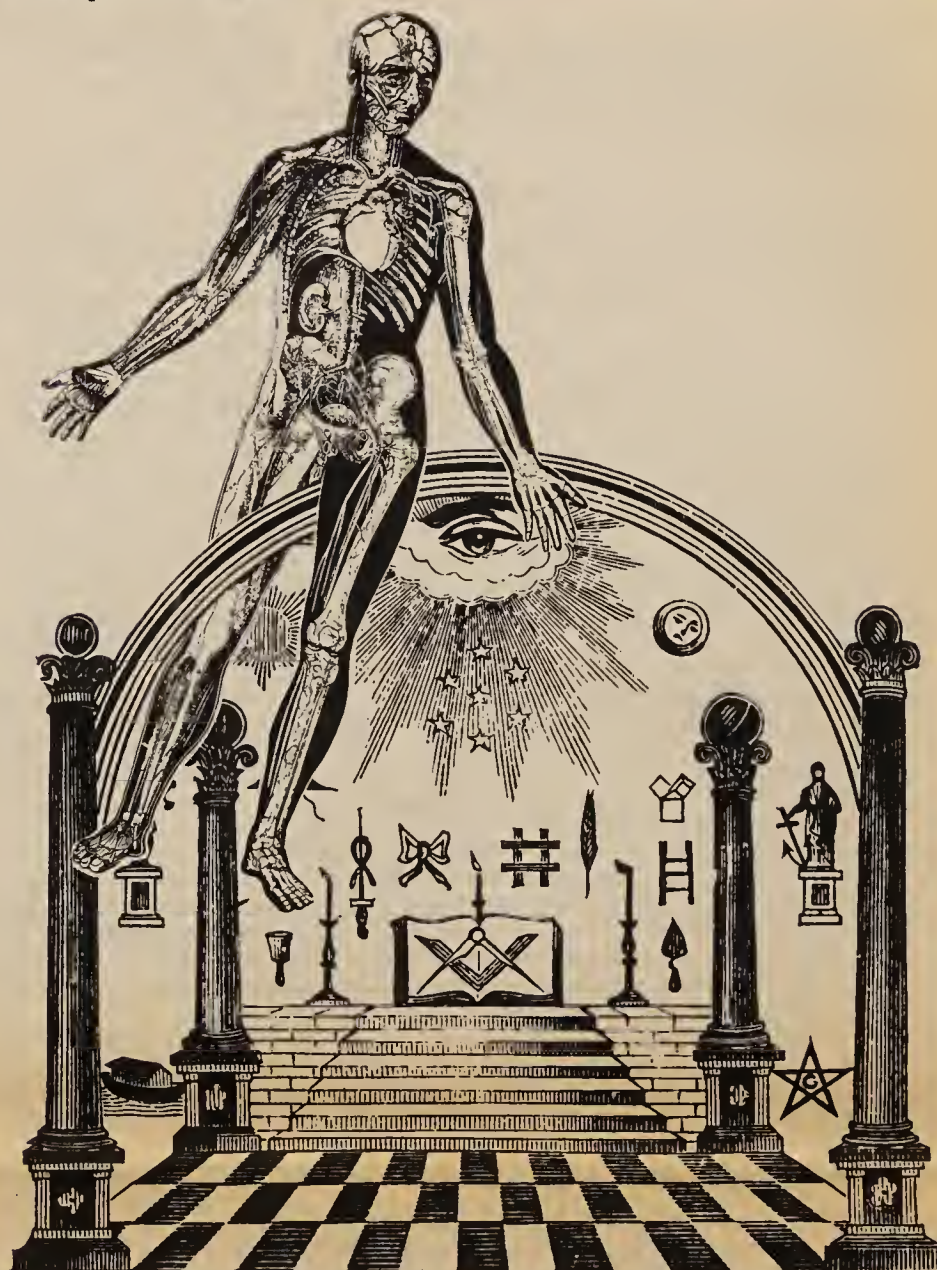
A colleague at UCSD told me that the real issue if God is dead, is what are we going to do about immortality. One of the great powers that has taken human beings into the mythic and the mystic has been the attraction of immortality. What has happened as myth and mysticism have waned is that those of us in the white coats have begun promising immortality, and we've been getting a lot of money for it. Get a million and a half grant, do a little research, and we say we're going to cure cancer, cure coronary vascular disease, discover the secrets of aging, even clone people. And you show me a religion that doesn't have immortality and I'll show you an atheistic totalitarianism.

But what about the counterbalancing force of myth in this age of science? The church has failed us, probably for the same reason the humanities have failed us: They have chosen a confrontational rather than a symbiotic relationship with science. And as they have, they have also adopted the worst features of the scientific method, in an epistemology where it has no place.

Five myths have persisted throughout history, as Joseph Campbell writes in one of his books on the masks of God. The myth of the theft of fire persists, whether in the form of the Promethean stories or in Robert Sinsheimer's book decrying the tampering with genes.

The myth of the deluge comes down to us: the story of a cataclysmic event that will wipe us out. Earlier, it was the flood; for us, the Damoclean sword of  $E = MC^2$ . We fear the radiation, not the rain.

Other ancient, durable myths: The land of the dead. The virgin birth. The resurrected hero. But what do we have today for myths? Luke Skywalker. We need a myth to live by, to bind us together in a civilization, to give us a



morality, a set of values and concerns to share. But I don't find it, not in our literature, not on the silver screen. And I'm getting nervous.

The thing that makes me the most nervous is that we are turning to pseudo-science and science fiction for our myths. The boundaries are blurring between biochemistry and nutrition on the one hand, and immortality and the cures for cancer and the common cold on the other. If myth and science become too identified, science will be destroyed. We will promise too much and deliver too little. And the promises of pseudo-science will become confused with the search for knowledge that constitutes real science.

The science writer, the humanist, the scientist, must all talk to one another, and talk to society. We must develop approaches to make people aware of the differences among

science, technology and the humanities, of the values of arts and of the holistic nature of all human endeavors and creativity. Not the twoness or threeness of culture, but its *oneness*.

To do that, we will need to speak in many tongues including the language of science, which is mathematics. We will need to consider the wonder and relevance of human endeavor as a whole, not as parts.

We must demand, not just of scientists, but of every human being on this earth, that they begin to understand that we cannot replace Ten Commandments with first ten amendments, or with ten principles from physics, and somehow come out whole.

We have to demand that each individual begin to understand the nature of the values and morals and ethics by which he or she lives in a society.

### The problem defined

The Problem is: How do we focus our work? How will it be applied for human good or ill? New developments in molecular biology pose almost Catch-22 questions. It is at this point our Western ethical tradition rooted in Greek, Roman, Christian and Jewish thought can serve as illuminators and guides as we seek the good society and the good life. I must make it very clear: they are illuminators, not authoritative dictates — as the Moral Majority would like us to believe.

Einstein saw this clearly. He suggested that not only must we temper our investigation by what he called a holy curiosity, but as members of the human family we have a responsibility to address the larger social issues that may relate to the use of what we discover. Let us hope that the leaps of faith we make will contribute not only to our better theoretical understanding, but be a source and make a contribution to a more humane existence on this planet. —J. Wesley Robb

*J. Wesley Robb is professor of religion and bioethics at USC. He is the author of The Reverent Skeptic and An Inquiry into Faith.*

The problem is not how to acquire more technology, it's how to set limits on what we have already — how to make it work for us. Professor Saltman's rhetoric, it seems to me, is filled with the language of a society that is now sensing a loss of power in the world.

And our problem is to understand this change that's taking place because though it's exciting it's also frightening.

—Robert Westman

*Robert Westman, a professor of history at UCLA, is editor of The Copernican Achievement.*



## The human side of the equation: looking for values in science

By Glenn T. Seaborg

For many years, we have heard people refer to the present as the age of science. But more and more frequently, I am hearing it referred to as the age in which human values have disintegrated, to be replaced by shoddy substitutes.

The implication is that a causal link joins these two views: that the advances of science have torn the very fabric of life and have strained society unbearably.

Society is based on institutions that have weathered the ages and that change slowly, step by tiny step. Science, on the other hand, moves in quick step. Because of this, many people think that scientists go to bed at night with dreams and wake in the morning with revolutions in their heads. These people see science as a goad that drives society to uncertainty and bewilderment, threatening all the things that people hold dear: family, clean air, seeing a forest on the horizon, having fresh water to drink.

Scientists tend to think of science as a safeguard against disaster, a tool for bettering the future and the present. They think of themselves as laboring tirelessly for the betterment of the human race and having all kinds of fun solving highly important puzzles as they do this.

But the public often describes scientists as eggheads. They think of them as either impractical dreamers, innocently playing with the fate of the world, or as bloodless, calculating machines who could care less if the world exploded, as long as they could accurately measure the bang. And this is the interesting discrepancy. Somewhere or the other, along the line, the channels of communication have failed. I regard the general need for communication in science to be one of the high-risk problems facing society today.

Before I get too far along, I would like to touch on the idea of human values. Values are related to choice. In the very act of choosing, we assert a value, that one thing is better than another. Is solar energy better than nuclear energy? Is organic food better than food dosed with additives?

But choice depends on information. How can we make a choice if we are uninformed about the options? Without information, choice becomes a mockery and loses its relation to value.

Communication is the crux of the problem. We are dealing with the problems of an information explosion: where to store it, how to classify it, how to organize it, how to remember it. Public access to information is limited. Not so much because the information is concealed, but because the public does not know which questions to ask. And because it has not occurred to many scientists to mention what they are doing and thinking.

Scientists like to think of themselves as too busy to be PR men. I believe, however, that we need to examine this proposition a little more carefully.

If, for example, I were approached by someone who wanted me to invest in a Tanzanian gold mine, I would ask long and searching questions. I would want to assure myself that the gold mine actually existed, that it truly contained gold, that the gold could be extracted at a profit, and that the people who wanted me to invest were honest and capable of working the mine. I would want to know that I was not being taken for a fool or taken for a ride.

I've chosen this parallel rather carefully. I see the public in the position of the investor and the scientist in the role of those who ask for investment monies.

I believe we scientists expect too much of the public if we ask it to invest in science — that is to say, to pay our salaries, to buy our expensive equipment and to finance our operations — unless we are prepared to account for what we are doing: to say where the monies are going, to share the excitement of our research, and to give the public access to what we are learning.

I think we need to convince the public that the scientific gold mine will pay off, even if the benefits are not immediate and obvious. We must begin a conversation with the public. I think that glaring dangers may result from a lack of communication.

As an example of the information gap, we need look no further than the public evaluation of the relationship between science and the state of the world. With discouraging frequency, the world is characterized as unfit for humans, and science and technology are blamed for its decline.

To some extent, we will have to grant the truth of such statements. If it were not for the insistence and curiosity of science and technology, we would not have our current pollution problems. No one would worry about dying from lack of air in industrial Los Angeles. No one would worry about the effects of acid rain on the fish in our lakes and streams. No one would sit up at night agonizing about the first-strike capabilities of various powers and superpowers in the military world. No one would worry about additives in food causing cancer. No one would fret that the sheer plenty that is produced on farms would result in a fall in the price of produce and a reduction in the buying power of farmers.

These problems are uniquely associated with science and technology and no one worried about them before. But, instead, we worried about the pollution that horses left on our city streets. We worried about dying in a Los Angeles rendered smoggy by Indian campfires. We worried about wars in which our menfolk died from spears and arrows that sometimes wiped out whole villages and tribes. Instead of worrying about cancer-causing food additives, we worried about the botulism that the additives suppressed. And instead of worrying about the price of produce falling in a year of plenty, we worried about starving when there was nothing to eat. I was a young man in the Depression and I can remember that one of my main worries was exactly that — where to get my next meal.

In short, we just worried about a different set of problems. Those who look at the world today and see it as a pestilence-ridden hellhole do not see the problems we have sidestepped. They are missing pieces of information. They don't know the options we had when we chose our present path.

Today, we are walking down a path that will lead us to some unknown destination. The decisions that we make today will influence that destination. If our information is distorted or incomplete or unavailable, we will certainly make wrong turns and waste resources, time and money.

I would like to illustrate this with two examples. The computer revolution is one of the changes today that make people uncomfortable. Many people feel helpless in the face of computer encroachments. They swap horror stories about computer errors. They fret that their children will forget how to add with a pencil and paper, and will know nothing but button punching and passively accepting an answer on a computer screen.

This second fear I would like to put in perspective with a conversation from Plato's

*Phraetus*, in which two Egyptian gods argue about the menacing invention of — of all things — writing: "This discovery of yours will create forgetfulness in the learner's soul because they will not use their memories. They will trust to the external written characters and not remember of themselves. This specific that you have discovered is an aid not to memory, but to reminiscences. And you give your disciples not truth, but only the semblance of truth. They will be hearers of many things, and they will have learned nothing. They will appear to be omniscient and will generally know nothing. They will be tiresome company, having the show of wisdom without its reality."

Nowadays, if you can't read and write, we don't say that you are disciples of the truth, we say that you're illiterate. In the future, we will say something similar about people who have no facility or familiarity with computers. This is threatening to many because they are ignorant of computers.

Far from worrying about children forgetting how to add and subtract, I would recommend teaching children the elementary use of the computer, beginning in the first grade. The computer is a tool, the same as a pencil.

Although computers come with risks, as do all human inventions, they arrive with a raft of benefits that I believe greatly outweigh their disadvantages. But because of misinformation, the public has greatly inflated the assessment of computerization's risks.

Solar power presents the opposite face of the coin. Solar is the energy source that is considered to be nearly free and essentially risk-free. Therefore, I was very interested to read in *Physics Today* that the sand and rock used in the storage part of a solar home's heating system often have a uranium content that leads to the emission of large amounts of radon. Radon is a gas that can be breathed, and it emits alpha particles that are more ionizing than gamma rays, the radiation that we've been



Glenn T. Seaborg is University Professor of Chemistry and associate director of the Lawrence Berkeley Laboratory at the University of California, Berkeley. The co-discoverer of plutonium and nine other transuranium elements, Seaborg received the Nobel Prize in chemistry in 1951.



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led to fear from nuclear power plants. In fact, a dose found in one solar-heated home exceeded the dose allowable for uranium miners. The adverse health effect is orders of magnitude higher than that resulting from nuclear power plants, even for people living near such plants.

To the scientists today, it would appear that society's trying to pull in its horns. Arthur C. Clarke, the science-fiction writer, has characterized this phenomenon as a massive loss of nerve. It's a subject of much concern and bafflement that in a world where life expectancy is up, the death rates of infants and mothers are down, and the accident rates in industry are much reduced, that the public should show a growing and compulsive involvement with risk and safety.

Science is said to be risky and some suggest that consequently it should be muzzled, and that technology should be shut off. Barely less radical is the suggestion that both should be slowed down until society has time to assimilate the gains that have already been made. Whenever I hear these suggestions I am reminded of the old French proverb: Ah, for the good old days when we were so unhappy. People yearn for the bad old days because they are familiar. People have a relationship with the past that they have not established with the future.

I'm not one of the people who complain about children who pour quarters into Space Invaders and Intergalactic Battle electronic games. Nor do I become upset when it's said that the current generation has neglected Dickens and Milton in favor of science fiction writers like Larry Niven, Hal Clement or Robert Heinlein.

These young people are establishing a relationship with the future that's exciting and that holds nothing of the dread that sometimes visits their elders.

I think we can blame this condition on ignorance. The public finds itself in the position of making decisions in the dark, a frightening situation at any time. It is not surprising that they want to walk slowly and

carefully and peer around them and sound alarms frequently.

It's time for the scientist to assume his share of blame for this loss of nerve. Some of the blame is due to the scientist's taciturnity, his desire to have all the fun to himself and perhaps even his desire to feel wise by virtue of isolation. It's time for scientists to admit that the scientific community needs the public. Scientists cannot operate in a vacuum, anymore than the public can make rational decisions without the facts.

I think it's time for scientists to learn to communicate better with science journalists, to learn something about their job. In many cases I would say that science writers are better equipped to communicate about science than is the scientist himself. The science writer spends his time getting a view of the forest — that is, science; the scientist spends his time looking at the trees and at the leaves. Science writers are in a unique position: they can tell the scientist what the public is thinking, and they can tell the public what the scientist is thinking. A public that understands science and that does not regard it as an immovable object or an irresistible force will be able to assess the real risks that science can pose, as well as the benefits that it can offer.

Science journalists can let the average person know that science is something that his daughter can do to earn her living when she grows. Or something that will save the life of his son when he is born with a heart defect. Science writers can tell the public that science is an art, just as music, painting, dancing and sculpture are arts: All of these fields demand long labor to reach a high level of skill, and all demand harmony between painstaking discipline and creativity.

Science writers can communicate to the public that science, far from being removed and destructive to humanity and human values, is the single most distinctively human occupation ever conceived. My personal thought is that the problem that we are facing in communication in this field is a high-risk problem, but one that is eminently solvable.

### Bias and the science writer

I think it's important for people not merely to know that if they're men they're likely to have a sexual bias and if they are whites they're likely to have a racial bias, but I think it's important for people to try to find out what their metaphysical biases are. Because if they don't do that, the information that they believe they are giving to the public is going to be very far from pure information. Nobody can discount his biases completely, but he certainly can do it a little bit better if he knows what they are than if he doesn't even know that they exist.

—W.T. Jones

W.T. Jones is a professor of philosophy at California Institute of Technology.

I think this question of bias exists in all of us. We all have biases, we all express biases — newspaper reporters are no different from anybody else. It's up to us in the media to press scientists over and over again and try to uncover their biases.

I'd like to suggest to you that we as reporters have a particular role to play. I think as we increasingly cover science and the social institutions that both control and permit the expansion and encourage the expansion of science, we have to remember that along with that has to come a development of social and behavioral scientific inquiry because men build machines that are truly wonderful, only to find themselves next to helpless when it comes to treating the social disorders that often follow the introduction of these machines.

I think we need to ask scientists as they do their work: "Can you predict or at least indicate to us or do you have any sensitivity to what social disorders or orders may flow from the work you do?" And then we must tell the social scientists: "For heaven's sake, start thinking about those problems so that we can create the social institutions or so you can guide us toward creating the social institutions that will be necessary to cope with either social disorder or preventing social disorder from the pace of science and technology."

—David Perlman

David Perlman is associate editor and science editor of the San Francisco Chronicle.

Some of the problems that we have discussed are problems that are definitely attributable to the press. In many cases the media is not equipped, or thinks it is not equipped, to cover these problems in science. Any of you who have seen science and medical reporting on local television understand that. It is also true at most newspapers.

Occasionally, however, the problem is that we don't get a heck of a lot of help. In some cases it's because the scientists aren't thinking ahead; in other cases it's because there's no answer when an answer is demanded.

—Joel Shurkin

Joel Shurkin, former science editor of the Philadelphia Inquirer, is a science writer and instructor at Stanford University.

## Science and the imagination

By David Kennard

I sometimes wake up in the morning and wonder why I'm professionally involved in trying to communicate science. One of the things that most excites me is that one can put across, with some luck and some attention, a sense of wonderment, childlike bliss. There are so many stories in the press and on television today that do anything but arouse a sense of childlike wonderment. That sense of wonder is certainly one of the things that makes me enthusiastic about these enormously long television series that take two years to make — that's a long time to spend making something.

One of the questions that worries me is whether we're using our imaginations enough in putting across science. I sometimes think we're not. We're not taking quite enough effort to get out there into the information marketplace and really grab the minds of people who are exposed to a lot of other information out there that is just more sexy. I think we can think a little about that.

And one of the questions that also interests me is whether it's inappropriate to get emotional about science. One of the questions often put to me about series such as *The Ascent of Man*, or James Burke's *Connections*, or Carl Sagan's *Cosmos*, is whether or not people feel entirely happy when Bronowski in his own way becomes emotional about the implications of Auschwitz, or when James Burke becomes emotional in an entirely different and humorous way about something that some people might consider trivial. Or whether it is appropriate when Carl Sagan glazes over in wonderment at whatever it happens to be. After all, that's not what we scientists and we reporters of science are supposed to do. It's somehow taboo to get

enthusiastic or emotional about it. When the filming's over for the day and we go and have a drink in the bar we stop talking about what we're going to film tomorrow, we sometimes actually have philosophical conversations. All of the people who I've worked with — the writers and the presenters, Burke, Bronowski, Sagan, and others — are worried from their different perspectives about a threat to science at the moment. They mention it constantly: The scientific method has only been around for 300 years. Even back in Newton's time, it was a little edgy as to whether he was really a scientist seven days a week. Are we to assume now that science and the scientific method will remain the established ways of properly investigating the universe? I'm sure that we believe that the scientific method is exciting: It is the way to understand the entire mechanism of — dare I say — the *cosmos*. But I think we have to face up to the fact that a lot of people out there are just still not interested enough in science.

Bronowski was always worried that this was part of the retreat into what was comfortable. He would also say that there was little chance that we would have a democracy of the intellect, which, to him, was our great hope in keeping the power of knowledge out of the hands of an elite. If people did not have the self-confidence to be able to handle new information — not just on a what-if basis, but real information. They just didn't like to have their paradigms shifted. And to him this was a great source of concern.

What always used to baffle James Burke, who started off as a science writer and reporter, is the way in which people would accept the received idea, the pre-packaged notion. Life is too busy, you know; I just received a few ideas and that's it. Thanks.

And, therefore, people would constantly be stimulated not by new interpretations of history or perhaps seeing in a different way the contributions to history of technology, but would always prefer to be stimulated by the what-if fringe.

I think it's also because science is tough to understand. It is. I find a lot of it entirely, entirely incomprehensible; I'm stunned that I don't even know where to go into certain subjects, and I've been hanging around the fringes of science for years and years.

I believe that we've got to fight the pseudo-sciences on their own turf. I think we've got to accept that we have to be both imaginative and emotive when we put across science. First we have to give the context. As far as I'm concerned when we put information across in historical series and things which are attempting to explain present-day science, you have to give the context on two levels. Never ever give a story from any point of view without answering that question "So what?"

I think the second point is that we must appeal to the emotions in order to combat all that other information that is appealing to the emotions. Almost every other kind of information people get is appealing to the emotions, and if ours doesn't it kind of sticks out.

Sports appeals to the emotions. The arts appeal to the emotions. Everything else in the newspaper or on the TV affects emotions. "And now a science program." It's not in three dimensions. It's in black and white, where everything else is in color.

I know that the scientific method is based on the fact that one mustn't allow emotions to play. But there comes a point where we have to say, no, we're going to go for it. Emotions don't just have to be shock, horror emotions. They can be wonderment and bliss.

Television producer and film director David Kennard heads his own Los Angeles-based production company. He produced the Carl Sagan series, "Cosmos," and directed the Jacob Bronowski series, "The Ascent of Man."





## Looking and listening: public perceptions of science

By James Spaulding

My biases stem from 20 years experience as a science writer for the *Milwaukee Journal* and the last 11 years teaching at the University of California at Berkeley, teaching reporting and newswriting including science writing. I believe that science and scientists should be treated no differently by the news media from any other segment of society. They shouldn't be coddled or catered to. If scientists sometimes are misunderstood and if scientists are misquoted occasionally, even often, so are politicians and policemen. That's the lot of the news source and it's the lot of the journalist to do his best to understand the facts, to avoid error but to fall short in doing this. It's a self-correcting medium, as Eric Sevareid has said. The news isn't always accurate with the first story. And of course science is a self-correcting enterprise, too.

The intelligence of the reading and perhaps viewing public tends to be underestimated, especially by editors, sometimes by reporters. Most reporters find that out usually to their embarrassment.

Scientists are inherently no different from other members of society — they get excited about the new insights into the universe they live in, so I think do the rest of us. Scientists don't need to be tricked or cajoled into thinking that facts are interesting; most of the rest of us don't either. Not everyone reads everything in the newspaper. I don't, you don't. I don't read the sports pages much. Should the sports stories be written for me, someone who is not particularly interested in sports? If I were one of the people who is interested in sports I might quit reading because sports stories would just become too oversimplified and diluted with silliness and the facts would be hard to find.

I feel the same way about science stories. Not every science story is for everyone. It shouldn't be written for everyone. Every science story has its own readership. It's naive to think otherwise. It leads to writing down to the reader. I think the role of the news media is to inform; it's not to educate primarily and it's not to entertain primarily — it's to inform the electorate so they can make sound judgments. To carry out this role is difficult and demanding. The media, the press, have a special role under the Constitution to do this.

I find myself stirred up by what seems to be happening in the media's treatment of science. What's happening, it seems, is a trend to turn the news media into the entertainment media. And if that should continue I think the public will be less informed about science, even misinformed about science.

This seems particularly obvious with television. At the recent Case meeting in Washington, D.C. on communicating university research, the TV people made it clear that what TV wants is comic book science, making fun of science or at least making light of science. The sort of thing Senator Proxmire does is thought of as one way to sneak a little science past editors who fear that science is serious and therefore not entertaining enough.

The TV people, in their own defense, say that if they can just hook ten youngsters in every major city on science it's better than talking to a small audience of adults who are already hooked on science. Is it? I'm not so sure.

My colleagues in TV say that network coverage of science is negligible unless the science is spectacular and local TV doesn't cover science unless the story is sensational. Walter Cronkite's "Universe" is gee-whiz material.

At the annual meeting of TV news directors, the biggest meeting of TV news people, no science reporter has ever been asked to speak. And science coverage is simply not discussed. Business reporting's been discussed, the business community complained about business reporting.

Newspapers these days, particularly new newspapers, seem to feel more and more obliged to be entertaining rather than informative. They seem to imagine that their readers have become so spoiled by the entertainment of TV that they no longer care

what's going on in the world. Newspapers are becoming entertainment magazines. Even the *New York Times* reflects this. At the Case meeting, Bill Stockton, the science editor, talked about the newspaper's research department which tells the editors what kinds of stories readers prefer — presumably so the editors can provide more of such stories, attracting more subscribers.

Should the media simply give the public what it wants, assuming that what the public wants is more entertainment and not information? No, said Stockton, and I certainly agree. Some of the news is entertaining, some of it's happy, though a lot of the news is unhappy and disturbing. Our main role as the news media is to provide that information, informative news — happy or

not, entertaining or not. This phenomenon of turning the news media into the entertainment media isn't limited to science news. It even affects news about life and death.

I think this assumption by editors and news managers, if that's what lies behind the trend, that people aren't interested in news about the world they live in including the findings of science, I think this assumption is both wrong and demeaning. The public doesn't have to be wheedled, coaxed into reading news about science or anything else. News doesn't have to be concocted, packaged or dramatized as larger than life. It's life that's interesting, not the overdramatized imitation of it.

## Is there really such a thing as an "expert"?

One of my thoughts on the subject of public perceptions of science and what sorts of things affect them is the word "expert." At *Science News* I never use it and when I'm in a position to censor someone else who has used it, I do it. An expert to me is someone who deals in a subject about which all or most is already known and happens to be one of the people who knows it. It's not just a matter of semantic fine-tuning. Calling scientists experts enforces a perception that their job is to be right, not to ask questions. That's some burden.

By extension, anything short of a correct solution or correct prediction — whether "anything short" means a wrong answer or just not knowing or even not knowing yet, we'll find out in a couple of weeks — is, in a sense, failure or inadequacy or something. And since an expert by definition knows the answers, anything less than this kind of correctness, "thinking right," is irresponsible, maybe. If "right thinking" has a familiar ring, think of the rhetoric that precedes certain kinds of political purges. In Asia's past, various seers and sages often had the job of knowing, not just studying or examining what action should be taken or what battles would be won by various administrations. Such a burden presumably made for limited job security.

One consequence of this, by the way, is that some scientists are reluctant to speculate about interpretations of their data, thereby forestalling the time when they will be judged on their personal performance at being right. That's one reason why one of my favorite aspects of science writing is preserving the level of uncertainty — not running somebody out on a limb and turning speculation into fact.

—Jonathan Eberhart

Jonathan Eberhart is space sciences editor of *Science News* magazine.

## What prevents us from understanding science?

We have in our institutions and in our country a number of factors that are working to prevent the public's perception of science from being what it should be, which is accurate. That's different from good and bad. I think the key thing is accuracy.

First of all, I assume everyone buys the idea that in a democracy, not understanding what science and technology are all about in today's world is death. When people who don't understand what nuclear power is all about are perceived as holding opinions as valid as those held by people who do understand what it's all about, and there's no push in the society to make sure that the people who don't know what it's all about really know what it's all about, you've got a problem.

Where does the problem come from? In the first place — and the stuff C. P. Snow wrote 20 years ago is still valid — from the educational system. The educational system has done a woeful job of preparing people to face a world that's dominated by science and technology. Science and mathematics are more



## Reporting science is just part of the story

What the public perceives of science is determined to a very large extent, by what we, the science writers, tell them to perceive. It's what we ourselves perceive. Because news is what we say it is — like it or not.

What the public believes, however, is another matter. An individual's belief system is determined more by his or her personal experiences and social contexts. It's awfully hard to be a college student in San Luis Obispo and not be opposed to Diablo Canyon or to nuclear power. Convictions of belief, religious or otherwise; self image — all add up, I think, to a force that is much more compelling than even the best-written science news story.

So what I'm saying is this: don't expect science writing on any particular issue to be more than just one more factor in a very, very complex equation.

—George Alexander

George Alexander, a science writer for the *Los Angeles Times*, was formerly science editor of *Newsweek* magazine.

Of course, all of us want to print the truth and eschew falsehoods. The problem is that it is impossible to distinguish one from the other in many cases. And the task of the science writer — as, I might add, the task of the reporter in any field — is not to make that distinction. It is rather to lay out all of the facts to make the case for all sides, to give the reader the sufficient tools to evaluate all sides and to leave it at that.

It is my view that science should be covered in exactly precisely the same way that newspapers cover every other field of human endeavor. Science has no special place in the panoply of human endeavor.

Furthermore, science writers are not, should not be, cheer leaders for science or for scientists. And very often, I regret to say, that is not the case.

When I covered politics, I thought of politicians not necessarily as my enemies, perhaps as my adversaries sometimes, but certainly I covered them and brought to the coverage a skepticism about what they were saying. And I try to bring that same skepticism to coverage of scientific matters. Too often, I think, science writers — in much of the science writing that I see — science writers view themselves as part of the scientific establishment, and I think that that's unhealthy. I think that it contributes to the public's misunderstanding of science. I think it contributes to inflated expectations about what science will bring us which when these expectations are not fulfilled, leads to public disillusionment with science.

This century, of course, has been the century of science, the world has been remade in every area you can think of by science and technology. There's no gain saying that. And, at the same time, until the last decade or so, the public has come to think of science as the cure-all for everything and if only smart scientists will put their heads to the problems, they'll find the answers as they did to many things through the first decades of this century. And the last 10, 15, 20 years we have seen that somewhat turned around, and now there's a great deal of concern about all these problems that we have discovered that science brings along with it.

And much of the disillusionment, I think, that the public has had with science has been as the result of inflated expectations, in part, the result of cheer leading science writing.

—Lee Dembart

Lee Dembart is a science writer for the *Los Angeles Times*.



## Science and the Leap of Faith

poorly taught in the schools today than they have been at any time since I have been alive. People teaching science and mathematics in the secondary schools do not understand it. So how could they possibly teach it or explain what's going on to people — youngsters — or make them excited about it?

The next perception gained by John W. Non-scientific Public as he goes through life results from the media. If he's fortunate, he learns how to read, and can read things written by some of us. But most likely he watches TV and he gets all of this information about science from it. And it's the news programs that are important. The in-depth scientific documentaries, no matter how hard I and others might try, tend to diffuse only a little beyond those people who already have a scientific bent. But Media people, particularly in television, have absolutely no preparation to discuss science. That produces what I call the double filter.

The first problem in the double filter is the scientist. Like everyone else, he was a victim of an education split between the humanities and the sciences. He didn't learn how to communicate, so he lapses into jargon. The second problem is you have the TV reporter who has no idea what Newton's Laws are or

how to program a computer, and he's got to get it right and he's got to get his face on the camera. On top of all that, you have a news program compressing an issue that's very important into two or three minutes, when it should be a half hour, 45 minutes.

There's one more place that the public gets information about science. And that's from what I call the street. In conversations with people. That's where I got a lot of my information about a lot of things I didn't learn in school, and that's still true. In a place where we have free press, the public also gets it from books like *Chariots of the Gods*, and books on UFO's and other such things.

The net result of all this is that I believe today in the United States, there is not, in the public mind, an understanding of what scientific thinking is all about. Scientists don't have answers, they don't have facts; they have hypotheses that they then verify or do not verify.

If we as a society are going to survive, we have to change the educational process to prepare reporters to cover science.

—Gentry Lee

*Gentry Lee is executive vice president of Carl Sagan Productions and project engineer, Galileo Mission, Jet Propulsion Laboratory, Pasadena.*

## Does the public like the science it gets?

I believe that the public is not anti-science, that, in fact, the public is very favorably disposed toward science and, over all, has a pretty large interest in it.

Most of the public gets its science information from the media. That puts added responsibility on those of us who have, as our task, communicating science to the public.

Although the public may have a positive attitude about science, it shifts and falls as the public feels favorably inclined about institutions, or less positively inclined about institutions. The Vietnam era was a good example, when the public was showing less confidence in institutions over all. During that time it had less confidence in science, but still had more confidence in science than in any other field except for medicine.

John Miller at Northern Illinois estimates about half of the population is interested in science.

Only about a quarter of the population, however, according to his data, actually knows very much about science. So let's say you want to reach the part of the public that's

interested in science but doesn't know very much about it. The medium that you use then needs to be appropriate for that purpose.

It may be then that newspaper articles, special magazines and television specials are an appropriate way of reaching that group. But if what you want to do is reach people who aren't already at that level, then you need to be looking, I think, at other possibilities. You need to incorporate science into the things that people would normally be watching and reading anyway. News programs, in my opinion, are a prime way of making people aware of what's happening in science.

But just because the public is favorably inclined towards science doesn't mean that they accept it over all. They recognize risks and benefits; they seem to be more willing to make judgments about those risks and they seem to have more of an interest in wanting to take some of the control for that upon themselves. That, again, puts a responsibility on us to be communicating the kind of information that makes it possible for people to make those decisions.

—Carol L. Rogers

*Carol L. Rogers is head of the office of communications and membership at the American Association for the Advancement of Science.*

## Big pictures: the science writer as synthesizer

By Timothy Ferris

You've all heard any number of formulations regarding the estrangement of science from our culture as a whole. Evidence of such estrangement is ample and needs no reprise from me. You can find it on almost any level, the strange crippled member of the walking dead which apes its way through the public school curriculum wearing the garb of science, or the fact that *The New York Times Book Review* will regard a book on the life of Sylvia Plath as inherently important and will not so regard a book on the life of Edwin Hubble. The obscene comments with which producers of the major network television programs made known their displeasure at having had to devote any time whatever on their programs to events such as the Voyager encounters with Jupiter, Saturn. In short, everyone agrees that we would like to see science somehow more a part of our culture.

We can talk about this estrangement and the ways of repairing it on several levels. And the most conspicuous level, the one upon which we would tend most readily to target our efforts, is not necessarily the level that, in the long run, will be healthiest for science or for the culture as a whole. So, as you can see, this is going to be one of those short but dry cautionary notes.

My cautionary notes is this: In terms of the popularization of science, we've seen considerable strides made, let's say, in the last five years. Martin Gardner's sequel to his book, *Fads and Fallacies in the Name of Science*, which is coming out in just a couple of months, remarks that leading scientists have never been able to command the sorts of audiences, the sorts of book sales as have pseudoscientists and quacks. This isn't quite true any longer, that gap is narrowing; there's an increasing market for science; more people are reading science magazines, and so forth.

This is, I suppose, all to the good. But it does seem to me that we should keep in mind that this is a reaching of a popular culture by a popular science. There's nothing inherently wrong with that, but science writers must be expected to, and should anticipate, the same sort of difficulties that come to anyone else who reports popular success, and that is that fame is fleeting; that the degree of

communication is inherently limited; and that the degree to which you have brought your work into the culture of our society will be consequently rather shallow in terms of its root system.

The science writer is a translator of science to people. But, if as a science writer, you concern yourself primarily with how many people you're reaching or what sort of "impact" your message is having, you will, to some extent, always be pursuing a chimera.

So, I suppose I just would like to say a word in favor of old fashion lack of success in science writing, and in favor of taking the long view of things.

We'll see more books on science, I think, on the best seller lists in the next few years and we'll see more successful popularizations of science. Numbers will be counted up that show that science is reaching more people than ever before and possibly we'll even find that there's greater comprehension of science by the public, which is all to the good.

But beneath this there must be a deeper integration of science with our culture, and in this integration the science writer can also play a role. You know, if we think of the science writer as a translator of, let's say the vocabulary of science into something else, that, on the face of it, is a function no more significant than the function of a translator at the United Nations.

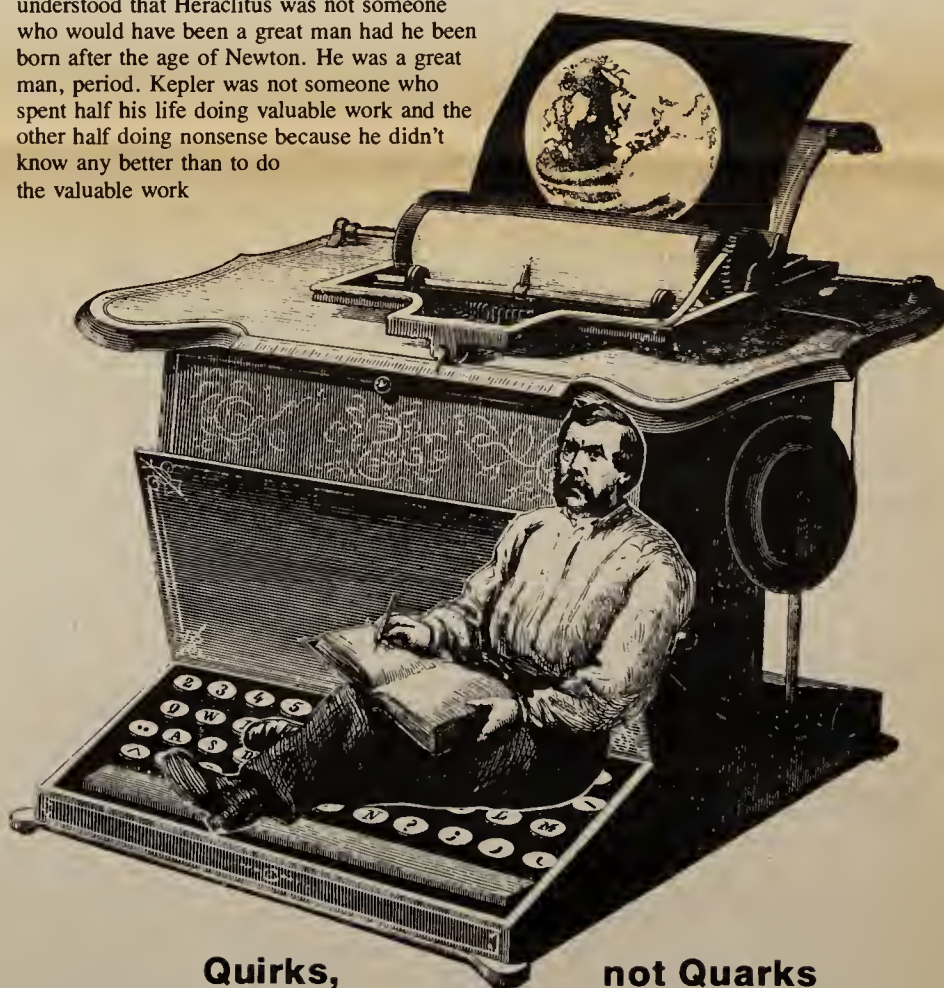
So, a science writer can act not simply to translate science to people, not simply to try to engage in a kind of literary Napoleonism in which you endeavor to make more and more people think the way I do in the fashion of the recent director of the BBC who said that the trouble with so many television documentaries is they all have the theme "Why can't everybody be more like me?"

Beyond that, there is a very urgent need for writers and other communicators of science to try to plumb as deeply as possible into the heart of what science means and to mend the estrangement which has left scientists feeling, in many cases, outside the mainstream of culture and which has left so many of the arbiters of our culture feeling that science is somehow an alien discipline or somehow less important than the ones in which they were educated during their tenure as undergraduate students in the humanities.

Finally, I would hope to be able to draw a portrait of what such science writing, science communication would look like. I don't really

know quite how to do that except to say that such science communication would not court popular values; would not seek fame; would work from fundamental sources; would work slowly and carefully and might take many years for its results to be seen. When its results were seen, I think we would find that people on both sides of the breach would have understood that Heraclitus was not someone who would have been a great man had he been born after the age of Newton. He was a great man, period. Kepler was not someone who spent half his life doing valuable work and the other half doing nonsense because he didn't know any better than to do the valuable work

all the time. Kepler was a hero. And if there are heroes alive today, and if we want to convey that fact to the public, then we must show how they are important to the very marrow of our cultural enterprise and not demand that that cultural enterprise be warped in order to take on a more scientific patina.



Quirks,

not Quarks

In the science articles that I write at the *L.A. Times*, I try to be more interested in why things don't work than in why they do. I tend to look for stories — and I have been searching for the right word to describe the quality of the stories that I look for — that are *quirky* in some way or other; whose quirkiness sheds light on both the material and, I might add, on the process. Because, to me, the process is at least as interesting, and perhaps more interesting, than the end result. And, I might add, it's the same as in politics that the process is more interesting or can be more interesting than the end result.

I tend to look for stories that have some puzzle to them in which the puzzle illuminates the work that's being done and also the great uncertainty about the scientific process — the scientific endeavor. If the public's understanding of science breaks down in any way or if you can put your finger on the place where it's breaking down, it would be in the appreciation of the uncertainty that is inherent in knowledge. That, as we have discovered in this century, the more you know, the less you know. Our ability to gather facts far exceeds our ability to come up with theories that put them all together. And that every theory is, of course, a theory capable of being supplanted by some other.

—Lee Dembart

*Timothy Ferris is an author, editor and teacher. His first book, The Red Limit, was awarded the American Institute of Physics prize for writing in astronomy.*





## Science and the corporate state

By Carroll W. Pursell, Jr.

In a just-completed study of congressional debates over science and technology policies since World War II, Sylvia Fries has discovered in them the consistent notion that "technology is the instrument by which man transforms science into history." It is only a new way of phrasing that famous Chicago world's fair "Century of Progress" motto: "Science Finds — Industry Applies — Man Conforms." And it is a continuing recognition that American history in the twentieth century is largely that of the unfolding corporate state.

Two brief examples of how this looks in practice will have to suffice. First, as Barry Commoner has documented, the environmental impact of our postwar scientific technology has been devastating. The shift from soap, cotton, manure and coal to detergents, plastics, and chemical fertilizers and nuclear energy has both laid toll upon our resources and overloaded our waste systems to a degree undreamed of before.

Second, the attempt by the government to ignore solar energy or, failing that, to subsidize research and development primarily in the direction of large power towers and similar centralized facilities, represents yet another example of technologies judged by their ability to enhance rather than endanger corporate hegemony.

We are left, I think, with a hardly surprising scenario in which the presumed progressive, neutral, and inevitable march of science is claimed to dictate certain complex, centralized, capital- and energy-intensive technologies, which we are then expected and manipulated into adopting. What we must as citizens realize is that technology is not all of a piece, and that it has no necessary connection with science. There is not a single Technology, there are a multitude of machines and devices. The choices between these are not dictated by science but rather the result of politics. As long ago as 1912 Frederick Winslow Taylor, the "Father of Scientific Management," told a congressional committee that both capital and labor must "take their eyes off of the division of the surplus as the all-important matter, and

together turn their attention toward increasing the size of the surplus until this surplus becomes so large that it is unnecessary to quarrel over how it shall be divided." Science, of course, merely hides — it does not remove — the political nature of a decision to opt for productivity and efficiency at the expense of the quality of work and the natural environment.

These elements — freedom of choice, democratic control, environmental viability, big science, and the nature of technology — are not only casually related. Almost twenty years ago Lewis Mumford pointed out that there have been, at least since Egyptian times, two kinds of technics (as he called them), "one authoritarian, the other democratic, the first system-centered, immensely powerful, but

inherently unstable, the other man-centered, relatively weak, but resourceful and durable."

What we as American citizens badly need to do — and we need the help of the press in doing so — is to first realize that technological choices are possible, then find the political power to make those choices. Technology must be demystified (and nothing so mystifies it as its presumed link with science) — we must realize that technology is a part of the very definition of our humanity and not something that comes only from science through the mediation of corporations aided by big government. By reclaiming our machines, we will ratify our humanness and reverse that perhaps description but never normative formula: Science Finds, Industry Applies, Man Conforms.

## On the hot trail of technology

The Industrial Revolution, which started about 200 years ago, is, I think, at the bottom of all this technology trouble.

After it happened, and for one reason or another, we became so enamored of mechanization and mass production and mass distribution that we just ran wild producing things with no attention at all to the side effects and all the rivers we were poisoning and the air we were poisoning and the resources we were chewing up, and all that. And, that went on, remarkably, for two centuries.

Well Isaac Newton said that for every action there's an opposite reaction, and it finally came along. You can pinpoint when it came along, too — January 1969, when that oil well blew out at Santa Barbara. The impact that had on people all around the world was all out of proportion to what had happened. We've had a lot bigger oil spills than that. And the beaches at Santa Barbara aren't really all that bad. But it shook up everybody, and the reason it did, I think, is because everybody said, "What are they doing drilling for oil out there?" "Who decided that we should do that?" "Who's minding the store?" And people looked around and couldn't get any sensible answers. And then, about six months later, the astronauts landed on the moon and turned their TV cameras on the earth and we got a picture for the first time — a real live picture — of what a pathetic little ball of mud we were, spinning around in space and clinging to earth's surface and completely dependent for survival on this little thin skin of resources.

Those two things, I think, got people in this country and all around the world thinking, gee, again, who's minding the store — what are we going to do? Well, again, the answer came out, well, ahem, some bureaucrats here or in Washington were supposed to make decisions about drilling oil wells and some other bureaucrats were supposed to decide where we built dams and other bureaucrats would decide where we chopped down forests and all that. And what had happened, of course, between the Industrial Revolution and the Environmental Revolution was this thing called the Managerial Revolution. Here we were in a democracy with people thinking that, well, in a democracy, all you do is you pay your taxes and go down to vote every two years and in exchange for that, George, there, in Washington takes care of everything. And, of course, this was one of the great classic untruths. Bureaucracy has to be watched *all* the time, and nobody had been watching it.

Then came the great awakening. "Gee, if we don't do something and lean on these people for all these outrageous things they're doing, we're going to hell." And that was what I call the Environmental Revolution, and I think that's an understatement. It was both a renaissance in the husbandry of natural resources — our natural heritage — and it was a renaissance in the democratic process.

— Gladwin Hill

Gladwin Hill was, for 25 years, chief of the Los Angeles bureau of The New York Times. From 1969 to 1980 he was the paper's national environmental correspondent. He is the author of *Madman in a Lifeboat* — Issues of the Environmental Crisis.

## Communicating priorities

The extraordinary growth of population, industry and technology in this century have created major psychological stresses on people. These stresses seem to reflect not only the decline of traditional religion but of nearly all flexible and personalized individual relationships. They have been replaced by bureaucratic structures involving mass-scale delivery of services to mass populations. It appears that this perfectly evident change in our lives has created innumerable psychological traumas. The powerful stirrings felt by restless students two decades ago constituted the preliminary signs of rejection and a search for alternatives. No one understands where or how alternatives can be found — but now we are all unhappy and we are searching.

These are not easy times. But because they are difficult times, they draw out our capacities to face the environment and to change it. My own life has taught me that it can be done and indeed that it must be done. One of the virtues of difficult times is that they concentrate the mind, enhancing our capacity to learn.

— William J. McGill

William J. McGill is president emeritus of Columbia University and adjunct professor of psychology at U.C. San Diego.

Science poses two questions for us; not only can it be done but should it be done? Just reporting or writing the facts without regard to what the consequences are or will be for human well-being is just not good enough. The whole story will bring into view the values affected by sophisticated controls and capabilities as well as the techniques themselves. A story or feature that is merely technically competent may actually falsify the realities written about.

Let science writers deal with the why of new turns in biology and physics and chemistry, not just the what. And once they adopt the concept of control as their focus, they will find themselves explicating the values and the moral principles at stake in science and technology. The word pictures that they draw will include issues as to what ought to be as well as what is.

— Joseph F. Fletcher III

Joseph F. Fletcher III is a professor of bioethics at the University of Virginia School of Medicine. His books include *Morals and Medicine*.

In the past twenty years, thanks to the Green Revolution, miracle rice, miracle wheat, we have increased world food production by as much as 40%. But during that period the world population has doubled. The gap between the number of hungry people and the amount of food needed to feed them has widened. Hunger is spreading unchecked by demonstrations, by fasts, by public declarations or even by charity. Everyone supports these noble causes in theory, but in practice there are no easy solutions to the problem. The reduction of the population is the obvious answer, but the numerical stabilization of the human race is not achieved in a decade, not in two, not in three. Perhaps in a half a century.

Thus at least for another century we must turn to science and technology to provide adequate food for humanity. The knowledge is there. It is the application and the will to apply that we don't see.

— Cyril Ponnampereuma

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